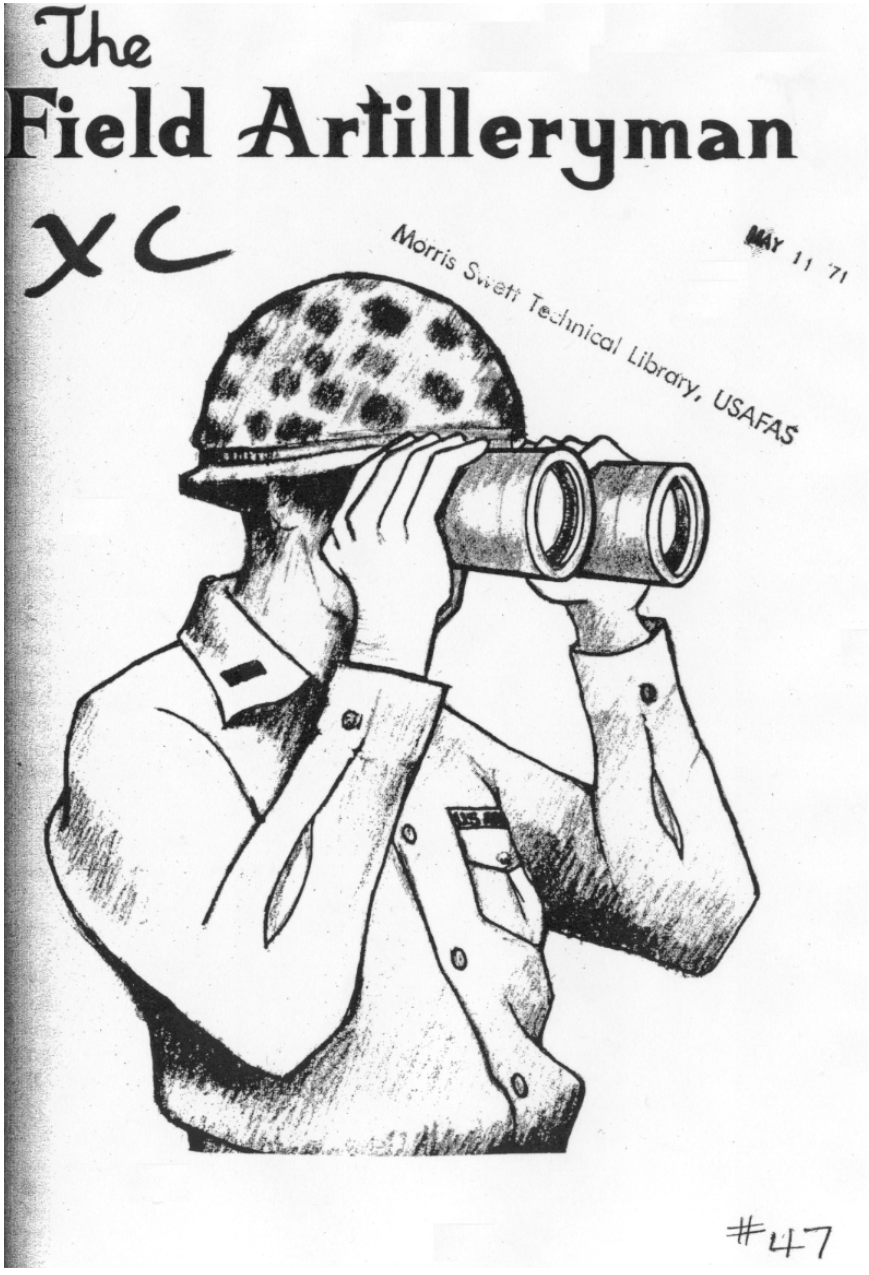
March 1971

The Field Artilleryman



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INSIDE THIS ISSUE

March 1971

U. S. Army Field Artillery School

The mission of the field artilleryman to support the ground-gaining arms with timely and accurate fire cannot be accomplished without the development and proper utilization of effective target acquisition means. This issue of **The Field Artilleryman** presents three articles highlighting recent developments in the Army's surveillance, target acquisition, and night observation (STANO) system.

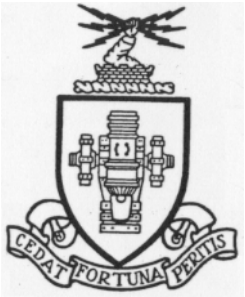
"Introduction to Unattended ground Sensors" discusses the use of remotely monitored electronic devices to detect ground based activity and to aid the field artillery in achieving its goal of first-round accuracy. "New Night Vision Equipment" relates the history and current employment of night vision devices known as image-intensification systems. These devices use the faint light of the moon or stars to "see" in the dark. A third article describes the XM76 antioscillation sighting system, a sophisticated image-stabilized viewing device which may become a standard item of issue to the aerial observer of the future.

Also in this issue is a thought-provoking and controversial discussion of armor versus field artillery, appropriately entitled "An Armored Challenge to the King of Battle." Another "armored challenge" is reported in "Tanks in the Artillery Role," which describes an occasion when armor was actually used as artillery.

Other articles featured in this issue include a perceptive analysis of the problem of AWOL in "Duty Bound . . . or Duty Bind;" a look at the field artilleryman and his many-sided military role in "The Field Artilleryman: A Military Polyhedron;" and an article by Peter F. Drucker of New York University, who explores the function of the officer as manager in "Organizational Demands and the Modern Executive."

All readers of **THE FIELD ARTILLERYMAN** are encouraged to submit articles for publication, comment on previously published articles, or offer suggestions for the improvement of this instructional aid's content and format. Correspondence should be addressed to: Commandant, US Army Field Artillery School, ATTN: ATSFA-PL-FM, Fort Sill, Oklahoma 73503.

THE FIELD ARTILLERYMAN



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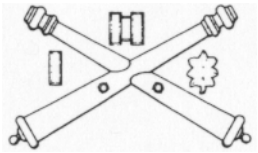
Career  *Memo*

PERFORMANCE: THE KEY TO CAREER ADVANCEMENT

The payoff in any assignment is how well one performs. This performance is recorded in the officer's efficiency report (OER) received for a particular job. The OER is the most important document in an officer's official record since these reports establish a trend in his manner of performance. An impressive manner of performance is a key to an officer's selection for—

- Promotion.
- Military schooling.
- Civilian schooling.

Everyone wants the so-called glamour assignments; however, many officers who have served in the less-than-glamorous positions have risen to the top. The reason is simple: No matter what their jobs, these officers did them better than anyone else. This should be your aim. Remember, it's not what you do, it's how well you do it.

NEW PREFERENCE STATEMENT

A new Officers Preference Statement (DA Form 483, dated 1 August 1970) is off the press and in supply channels. This new form should be completed in as much detail as possible, particularly paragraph 11, which deals with personal considerations. All field artillerymen are urged to insure that their current preferences are on file with the Field Artillery Branch. Contrary to popular belief, these **are** consulted by assignment officers.

AVAILABLE ASSIGNMENT LOCATIONS

In trying to prepare a meaningful preference statement many battery grade officers often ask the question "What stations are available?" The best guide to use in indicating your choice of location is to select posts where there are field artillery units. These are a greater number of branch material duty requirements for these posts; whereas, the requirements for locations without field artillery units are fewer in number and are normally branch immaterial assignments.

INTRANSIT PROMOTION

Many officers are experiencing difficulty with promotion to first lieutenant, captain, and chief warrant officer, W-2 while in transit. Paragraph 4, Department of the Army Message 927361, dated 13 October 1969, outlines current procedures to be accomplished by the losing command to insure that departing officers are promoted by the Department of the Army on their eligibility date. Effective 1 February 1971, these

procedures are changed in accordance with DA Message, Subject: Promotion While in an Intransit Status in Conjunction With PCS, dated 8 December 1970. Under the new procedures, the losing command, rather than the Department of the Army, will publish the orders promoting officers intransit. If an officer is not promoted while in transit, he may be promoted by the gaining command and receive an adjusted date of rank. However, this procedure frequently results in a loss of pay for the officer. Finance will not pay the difference in the pay scales accumulating prior to the date of the orders promoting the officer. The individual is required to forward a claim to the Army Board of Corrections of Military Records in order to obtain this money.

ORGANIZATION

An updated organizational diagram is shown in figure 1. The telephone numbers and general areas of responsibilities of Personnel Actions and Education and of the Assignment Section should be especially noted since the actions of these sections have the greatest impact on your career.

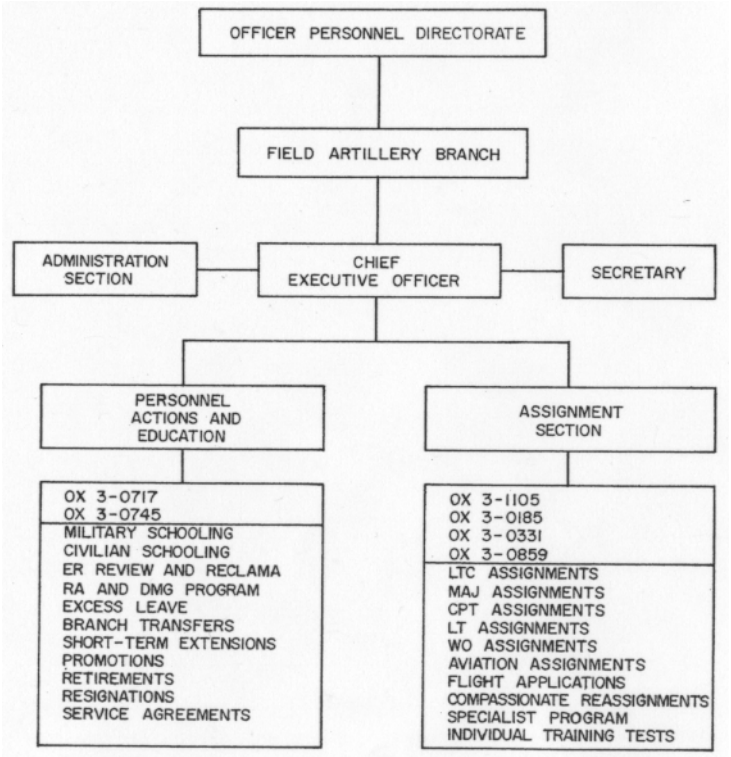


Figure 1. Organizational diagram.

Introduction to . . .

Unattended Ground Sensors

1LT John S. Nichols
Office of Doctrine Development, Literature and Plans
USAFAS

Recent improvements in equipment and techniques permit the field artillery to achieve its goal of first-round accuracy provided the target location is accurate. However, the field artillery target acquisition means have not always kept pace in the past with the dynamic improvements in equipment and techniques. In an effort to remedy this problem, to limit the night movement of the enemy, and to rectify associated problems, the Department of the Army has placed increased emphasis on the implementation of a highly effective surveillance, target acquisition and night observation (STANO) system in the field army. An important segment of this system is the development of unattended ground sensors (UGS).

In the Army concept of an advanced unattended ground sensor system, a surveillance platoon is capable of determining rate and direction of travel of an enemy force by analyzing activations of sensors placed in areas of suspected enemy activity. Using this information, the field artillery can compute an accurate target location upon which fire for effect can be delivered without prior adjustment. With this capability, the field artillery can engage the enemy with maximum surprise while expending a minimum amount of ammunition and endangering virtually no friendly troops in direct contact with the enemy.

The Army Concept Team in Vietnam (ACTIV) has successfully tested a wide variety of unattended ground sensors in a low-intensity combat environment and has recommended that many of them be procured in operational quantities for use in Vietnam.

DEFINITION

Unattended ground sensors are automatically operated, remotely monitored electronic devices used to detect ground based activity. In addition to target acquisition, sensors are used in two other basic roles—alerting (warning) and surveillance. Neither of these roles is limited by offensive or defensive considerations nor by specific operational environments.

INTEGRATION OF SENSORS

Integration is the key to proper utilization of unattended ground sensors. When isolated, unattended ground sensors are only a limited means of target acquisition. When properly utilized, unattended ground sensors are an integral part of the commander's total information gathering assets. Therefore, complete integration of sensors into the total surveillance system is required at all echelons.

Some of the information derived from the employment of sensors may be of sufficient urgency and accuracy that the commander may treat it as a target location and act upon it immediately. However, complemented with other intelligence-gathering media, sensors have a far greater effect on the mobile army's effort to monitor and counter enemy activity.

For example, the effective employment of unattended ground sensors in conjunction with other surveillance means permits an economy of force through the massing of fires or deployment of troops in direct proportion to the size of the detected enemy force. This capability allows the commander to successfully accomplish his combat mission without undue commitment of forces and weapons.

Unattended ground sensors indicate the presence of some kind of activity at a particular place and time. By comparing sensor detections with other information, the intelligence analyst may be able to determine whether the activity is friendly or enemy. If the activity is determined to be of enemy origin, the commander can readily react with field artillery or any other means available.

EMPLOYMENT

Unattended ground sensors have tactical application in all types of combat operations and in special surveillance missions. The number of specific employment possibilities is limited only by the user's imagination.

In offensive operations, sensors are emplaced in locations where the enemy is believed to be tactically deployed or in areas through which he is expected to move. When the enemy's presence is detected, he can be brought under attack through initiation of preplanned actions. In this type of operation, the emplacement and monitorship of, and reaction to, sensors should be controlled by the ground force commander responsible for the overall operation.

The following are some examples of offensive use of unattended ground sensors:

AMBUSH—The ambush is the most logical use for sensors. In such a situation, the ambush force can inflict maximum damage to the enemy by using sensor-derived information to determine the optimum time to open fire. In some cases the ambush can be conducted without direct contact by the friendly infantry elements. For example, command-detonated mines can be emplaced to cover the kill zone. When the sensors indicate the presence of a suitable target, the mines are command detonated. When the sensors are accurately emplaced, field artillery is an ideal means for engaging the target.*

LANDING ZONE MONITORING—Under certain tactical conditions, a commander may elect to preserve an element of surprise by conducting

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A related article titled "Locating Sensors with Q4 Radar" appeared in the April 1970 issue of* **The Field Artilleryman.

an airmobile assault landing without firing a preparation. Sensors placed adjacent to probable enemy positions or routes to the landing zone can provide the commander with an accurate indication of the tactical situation in the LZ without revealing his intentions to the enemy. In addition, the commander can monitor several landing zones prior to an assault landing. The sensings, complemented with other tactical considerations, will assist the commander in determining which landing zone to utilize.

OBJECTIVE MONITORING—When a terrain objective is designated, intelligence planning should include unattended gound sensors. Emplacement of sensors on terrain to be captured and along routes of approach and withdrawal provides the commander with timely information upon which to base his tactical decisions.

In defensive operations, sensors can determine the location or direction of approach of the enemy. Advance warning of the enemy's approach or of the assembly of hostile troops is a critical advantage to friendly elements in a defensive posture. Examples of defensive use of sensors are as follows:

BASE AREA DEFENSE—Sensors can be used in base area defense to supplement other means of surveillance. Sensors coordinated with sentries and other detection systems can be integrated with barriers and defensive fires into the overall base area defense plan. Sensors with long operating life are most appropriate in this application.

CONVOY SECURITY—The commander responsible for the security of a large convoy traveling along an insecure route can emplace sensors in likely ambush areas prior to the movement. Upon indication of enemy activity, the commander alerts the convoy and arranges covering fires. Long-term surveillance of frequently used routes can be assisted by emplacing unattended ground sensors that can be activated and deactivated remotely.

LISTENING/OBSERVATION POST—Sensors may be used to extend the listening/observation post capabilities. Manpower limitations in a tactical situation often preclude establishing listening/observation posts in desired quantities and locations. Sensors can help alleviate the problem.

In addition to their use in the classical operations just discussed, sensors can be employed in a virtually unlimited number of special surveillance missions, such as physical security of rear areas, logistical bases, prison facilities, command posts, munition stores, radio relay sites, and other important areas that usually are guarded with only a limited number of personnel.

LIMITATIONS OF SENSORS

Unattended ground sensors are not without limitations. The inability of sensors to identify signatures—that is, to distinguish between a military target and a nonmilitary target—is a formidable problem. The effectiveness of certain types of sensors tested in low-intensity conflict

is also reduced by false alarms. Animals, moving foliage, rainfall, low-flying aircraft, and friendly inhabitants are frequent causes of undesired activations. False alarm rates near populated areas are so high that certain seismic and acoustical sensors may be operationally impractical.

MEANS OF DETECTION

Unattended ground sensors are categorized according to the means of detection they utilize and the method by which they are emplaced in their operational location. The detection means include:

ACOUSTIC—Acoustic sensors utilize extremely sensitive microphones to detect audio signals generated by nearby enemy forces. Although the microphones are usually omnidirectional, the audio signals can provide target location and direction. The most advanced acoustic sensors are the ACOUBOY and ACOUSID, which are designed to land in the tree limbs of a jungle canopy where the microphones can enjoy wide reception. They are, most commonly, delivered by aircraft. Because of the high sensitivity of the microphones, these sensors tend to transmit extraneous signals in a noisy combat environment. However, spectrum analyzers have been developed to better analyze the sound waves and provide improved definition of the target.

SEISMIC—Seismic sensors detect vibrations of the earth caused by the movement of the enemy. Because earth vibrations travel extended distances before dissipating, the seismic sensors can detect a man walking at 30 meters and a vehicle moving at 300 meters. Since this type of sensor is characteristically susceptible to false alarms caused by background seismic activity, many seismic sensors, such as the ground seismic intrustion detector (GSID) and the patrol seismic intrustion detector (PSID), have been modified with an internal logic circuit and sensitivity adjustments to provide a degree of discrimination against the detection of nonmilitary targets.

ELECTROMAGNETIC—The electromagnetic intrusion detector (EMID), a typical application of an electromagnetic sensing device, establishes a radio frequency pattern, or field, around its antenna. An intruder moving into the radio frequency pattern causes fluctuations in the pattern, resulting in the transmission of a warning signal to the monitor. Since only the antenna must be exposed and the transmitter normally is quite small, an electromagnetic sensor is easily concealed. However, the device must be positioned in open terrain, such as trails or beaches, since foliage moved by the wind might activate the sensor. In addition, a large power source is required to maintain a continuous radio frequency field and the sensor is vulnerable to interception signals or jamming.

MAGNETIC—Magnetic sensors detect the movement of iron or steel objects through a magnetic field. Tests have proved this type of sensor quite effective for tracing the movement of vehicles and confirming the presence of ferrous material. Since only metallic targets cause activation, false alarms from animals and other nonmilitary targets are greatly reduced. The range of this device is comparatively short, however.

PRESSURE—Pressure sensing systems are typically employed near fixed locations, such as base camps, where installation time is not critical and where a permanent device is required. A pressure sensor transmits a warning signal when an intruder's weight compresses the soil around the device.

All the sensor systems discussed in previous paragraphs have operational limitations which prevent foolproof detection. To counter this shortcoming, Department of the Army doctrine suggests the use of two or more types of unattended ground sensors in the surveillance area to increase the reliability of detections by reducing false alarms and by improving identification of target signatures.

METHODS OF EMPLOYMENT

Methods of deploying unattended ground sensors include hand emplacement and air delivery by either fixed- or rotary-wing aircraft.

A typical hand-emplaced sensor system is the patrol seismic intrusion detector (fig 1). This portable, battery-powered system consists of four detector-transmitters with geophones and one receiver. The detector has a transmission range of less than 500 meters; the range is dependent on battery strength, soil type and consistency, and other environmental conditions. Each detector in the system is identified to the operator by the number of pulses and unique audiopitch which it transmits. The geophone is buried 2 to 3 inches below the surface of the ground and within 20° of a vertical position. The detector is turned on, and the gain control on the receiver is adjusted for optimum detection range with minimum false alarms. When the person emplacing the detector moves away, the receiver operator should hear a distinctive pulse and audio

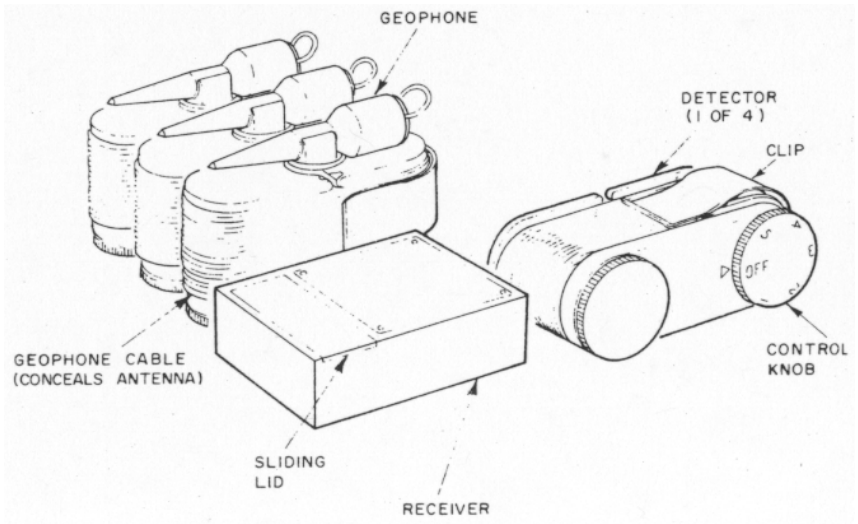


Figure 1. The PSID system.

Figure 2. PSID operational configuration.

pitch from the detector. These sensings will continue until vibrations of the emplacer's footsteps are out of range of the sensor. The movement of the emplacer away from the sensor permits the receiver operator to check the system for proper operation. A PSID operational configuration is shown in figure 2.

ORGANIZATION AND CONTROL

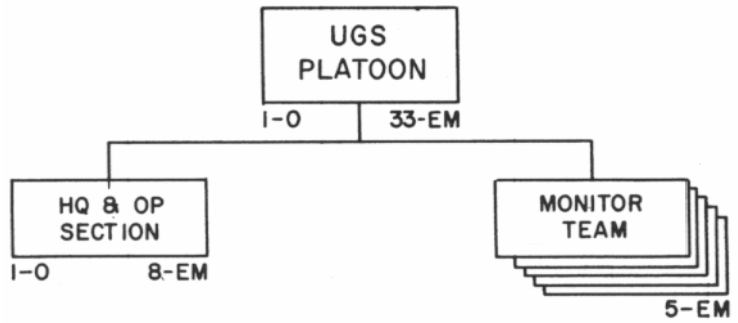
Unattended ground sensor management and general employment guidance is a command responsibility. Sensor systems must provide accurate and timely information to the echelon at which combat forces can

react decisively and take full advantage of the information. Since the equipment can be used by tactical units varying in size from small independent patrols through major divisional elements, a great deal of coordination is required.

A proposed basic organizational element is the divisional unattended ground sensor platoon (fig 3). The platoon is assigned to division headquarters and headquarters company and operates under the staff supervision of the G2.

PROJECT MASSTER

In consonance with the dynamic effect that sensors will have on the mobile army of the future, the US Army has made a radical departure from its traditional testing methods. Project MASSTER (Mobile Army Sensor System, Test, Evaluation and Review) has been activated at Fort Hood, Texas, to provide continuous testing and evaluation of doctrine, concepts, and material for Army battlefield surveillance, target acquisition, and collection of information.* With the implementation of sensor equipment and doctrine, an integrated battlefield control system, in which the enemy is located, tracked, targeted, and engaged almost instantaneously, will be well within the state of the art.



I - PLT LDR	**LT**		
I - PLT SGT	**E7**	**I - MONITOR TEAM CH**	**E5**
I - MONITOR NCOIC	**E6**	**4 - MONITORS**	**E4**
I - OP SGT	**E6**		
I - INTEL SGT	**E6**		
I - PLANS NCO	**E5**		
I - ELECT MAINT	**E4**		
*** I - CLERK TYPIST**	**E4**		
*** I - MONITOR**	**E4**		

*** ALSO LT TRK DVR**

Figure 3. Proposed divisional UGS platoon.

A more detailed discussion of Project MASSTER appeared in the September 1970 issue of* **The Field Artilleryman.

An Armored Challenge To the King of Battle

MAJ Hans R. Ammann
Swiss Army Field Artillery

The most significant step in the development of modern tactics was the invention of smokeless powder in the last century. This includes both the low explosives and the high explosives. During World War I, it became evident that the artillery had the ability to stop attacks against infantry and cavalry in the open if the fire was timely and accurate.

For many centuries unit maneuver decided the outcome of the battle; but during World War I, firepower increased to such an extent that most targets could be neutralized by area fire.

It also became evident at that time that the effect of artillery projectiles, whatever their characteristics, depends upon the quality of the hostile target. Millions of rounds have been delivered on entrenched armies without any decisive effect.

Since World War I the effectiveness of conventional shells has been improved, the prime improvement being the number of casualty-producing fragments that result from the explosion of a shell. The proper fuze may increase the bursting diameter, which can vary from 30 meters (105-mm HE) to 95 meters (175-mm HE). However, the effect can only be evaluated against soft targets; any protection can reduce the effect of the burst. For example, in Vietnam, artillery fire may have a tremendous effect on personnel in the open but may be capable of only limited neutralization against troops in bunkers or trenches.

To counter the effectiveness of the improved conventional shells, post-World War I weapon makers developed the armored weapon system to provide protection from all types of antipersonnel fire, such as machinegun fire and artillery area fire. The result was the armored weapon system. The tank and the armored personnel carrier now provide excellent protection against the effects of indirect field artillery fire and rifle fire. When these new devices appeared in battle, the ability to maneuver was regained and offensive actions became possible in World War II. What artillery fire had achieved during WWI in stopping attacks failed this time. In order to illustrate the artillery's reduced effectiveness against armor attacks, we have only to remember the advice given the armored forces in FM 17-15 (Tank Units, Platoon, Company and Battalion) to assault the objective under cover of friendly artillery and mortar airbursts set above the assailing elements. Consequently, the effect of several hundred thousand shell fragments must be considered negligible.

Whereas during World War II and the Korean campaign the infantry represented the main part of the aggressor's armies, we now have to regard the number of armored units as predominant. This would be especially true in the European theater. The armies of the Warsaw Treaty countries, for example, consist of mechanized infantry divisions and armored divisions only; the infantry division no longer exists. There are about 200 tanks (T-54, T-55, T-62) and about 500 armored personnel carriers in a mechanized infantry division. An armored division has 340 tanks and approximately 300 other armored vehicles. Therefore, we are confronted with the problem of destroying armored vehicles in such quantity that an armored attack can be stopped. A variety of direct-fire antitank weapons could be employed, but it is necessary to hit a hard target with two or more rounds of special ammunition in order to neutralize the target. Therefore, the question is whether a combination of direct firing arms will succeed in the timely neutralization of a sufficient number of hard targets. It is also questionable that this goal can be achieved with area missions using indirect fire. Considering this, the Russians decided to build up an armored force of strength unequaled in history. (Of course there are many other considerations, such as protection against nuclear fire, the decisive factor of offense capability, etc.)

INDIRECT FIRE VERSUS ARMOR

The relative effectiveness of indirect artillery fire against armor requires additional explanation. First, the tank company in combat formation represents a target approximately 1,000 by 6,000 meters in size. The space between vehicles within a platoon varies from 50 to 100 meters. Consequently, in an area of one million square meters, we should neutralize 20 hard targets, each measuring 3 meters by 7 meters. This represents 20 precision missions. The probability of hitting a point target is low and the expenditure of time and ammunition is high; therefore, the probability of hitting such a target by firing with the entire firing unit must be lower for reasons of dispersion and density.

Second, the targets are moving with the greatest possible speed, which further reduces the probability of a hit by direct or indirect firing. The best mean point of impact may never be found against moving targets.

Third, the normal width of sheaf of a firing unit varies between 200 and 300 meters. The width of an infantry platoon will seldom exceed this size; however, the width of a tank platoon scarcely lies within these limits. If a moving hard target is hit, the damage resulting will depend on the applied caliber of the weapon. It is doubtful that a 105-mm shell fired indirectly would cause serious damage, although the density of fire delivered by a 105-mm battery (theoretically 180 rounds in 3 minutes) would be desirable. On the other hand, 155-mm, 175-mm, and 8-inch shells capable of neutralizing armor could be delivered less

rapidly. The final protective fire has lost its value against an armored assault because, in the final phase, the antitank weapons, which are direct firing arms, must be given the opportunity to shoot and must not be forced to look for cover.

We must face the fact that conventional artillery in an armored environment has lost much of its tactical value, whereas in infantry combat conditions, it may be stronger than ever. Experience demonstrates that at the present time nothing should be impossible. Furthermore, it has been proved that for every offensive device, a counterweapon can be developed. In the field of antitank weapon research, a solution to regain the lost tactical advantage of the artillery still has not been found.

What the artillery needs is the ability to destroy armored vehicles by area fire. This ability would not only return a traditional significance to the artillery but also would solve the antitank problem and would have a tactical significance as great as that of machinegun fire and artillery fire on the battlefields at the beginning of the twentieth century.

The missions traditionally given to the artillery, such as protection of the flanks or neutralization of a hostile force, can only be achieved by the ability to destroy and stop armored attacks. It is the author's opinion that development of such a weapon system merits first priority.

EDITOR'S NOTE: *The opinions contained in this article are primarily those of the author and do not necessarily reflect the official position of the Field Artillery Center Team at Fort Sill. To stimulate professional thought and retain perspective on the subject*, **The Field Artilleryman** *asked Mr. Otis S. Spears, Scientific Advisor, U. S. Army Combat Developments Command Field Artillery Agency, to review the article. His comments are as follows*:

The conclusions drawn by the author are valid; and they point up an important problem area for the field artillery. For example, it is a fact that conventional field artillery in an armored environment loses much of its tactical value. It is also true that the field artillery needs the ability to destroy armored vehicles by area fire. Finally, it is true that development of the ability to stop and destroy armor attacks merits a high priority. It also should be stated that, to some degree, this is being accomplished but that additional emphasis is needed.

However, the article contains two erroneous implications—

- That the field artillery has very little or no capability against armored and mechanized units.
- That there is very little or no current research and development effort being devoted to improving the antimateriel capability of the field artillery.

Some of the specific statements which contribute to these erroneous impressions are as follows:

The article indicates that current doctrine approves of armored forces to assault an objective under cover of friendly artillery and mortar air-bursts detonating above the assaulting elements. This is true only when the covering bursts are of small caliber (e.g., 105-mm howitzer and 4.2-inch mortars). The statement about the ineffectiveness of shell fragments should be cast in this perspective; it does not apply to 155-mm or 8-inch howitzer fragments.

The author states: "It is also questionable that this goal can be achieved with area missions using indirect fire." This statement is correct in that it is still an open question; however, considerable research and development effort, directed toward development of at least better capabilities, is continuing in this area.

The author makes the point that, in area fire, the probability of hitting a point target is low, and that, therefore, the expenditure of time and ammunition is high. This, again, is correct, but it is not the whole truth. It is very important to note that the probability of defeating armored vehicles is enormously increased by judicious selection of methods of fire. For example, the hit probability can be greatly increased by closing sheafs and by employing other special artillery techniques.

The author's point regarding moving targets is only partially correct. It is true that a target in motion greatly reduces the probability of a hit from a weapon aimed specifically at that moving vehicle. A fortuitous hit, however, can certainly occur on a moving vehicle when that vehicle is within the area effects pattern. Here the odds of hitting the target depend on the density of the lethal agents.

OCS HALL OF FAME

New criteria for induction into the Field Artillery OCS Hall of Fame have been established. Any graduate of the Fort Riley, Kansas Officer Candidate School between 12 December 1946 and 21 February 1951 who was commissioned field artillery upon completion of OCS and immediately attended the Fort Sill, Oklahoma Field Artillery Officer Basic or Associate Basic Course may be nominated provided he meets one of the necessary prerequisites—

- Be a recipient of the Medal of Honor or Distinguished Service Cross.
- Attain the rank of colonel while serving on active or inactive status.
- Be appointed or elected to an office of national prominence.

Since its establishment in June 1968, over 130 distinguished OCS alumni have been inducted into the Hall of Fame. Hall of Fame officials, however, believe that there are many others who should be added to the roster of distinguished graduates. Individuals who are eligible or who know of anyone who meets the eligibility requirements are requested to contact the Custodian, OCS Hall of Fame, Leadership Brigade, Fort Sill, Oklahoma 73503.

XM76 Antioscillation Sighting System

In modern warfare, one of the most effective target acquisition means available to the field artillery is the aerial observer. Improved aircraft, associated equipment, and techniques have made aerial observation particularly useful in current stability operations in Southeast Asia.

During the course of the war in Southeast Asia, insurgents have become masters of camouflage. Enemy emplacements within their area of operation are normally well concealed and exceedingly difficult to detect

from altitudes of more than 2,000 feet. In order to identify enemy positions and troop movement, the field artillery aerial observer must conduct his reconnaissance at extremely low levels. However, combat experience has demonstrated at least two major disadvantages of low-level observation. First, aircraft flying at treetop level can easily be detected, both visually and audibly, by enemy personnel on the ground, who can then use small arms and air defense weapons against the observation aircraft. Secondly, although targets can best be detected in low-level observation, accurate plotting of targets is difficult because of the speed of the aircraft in relation to the ground.

In an effort to overcome these problems in low-level observation and to capitalize on the relative safety and target plotting capabilities of observation at higher altitudes, the Army is evaluating various types of observation equipment that would give the field artillery aerial observer low-level observation capabilities from altitudes above 4,000 feet (the altitude at which aircarft engines become inaudible to personnel on the ground).

Conventional optical equipment has been found to be unsatisfactory for use in a vibrating aircraft. Observers using binoculars experience extreme difficulty in acquiring and tracking the target and often feel nausea and vertigo.

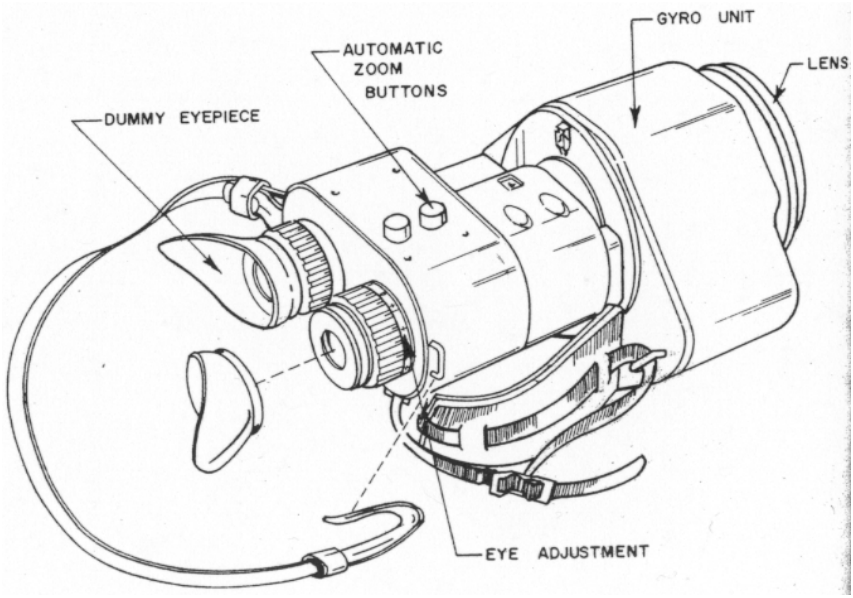


Figure 1. XM76 antioscillation sighting system.

The Army determined that the solution to this problem was an image-stabilized viewing device with zoom capabilities. Therefore, the XM76 antioscillation sighting system (fig 1) was purchased to satisfy an expedited nonstandard urgent requirement for equipment (ENSURE). The system consists of a lens component and an image stabilization component with power accessories. The stabilization component is composed of an adjustable liquid prism—a volume of liquid contained between two transparent plates which are controlled by a bellows arrangement—and small gyroscopic sensors which detect and measure any vibration of the viewing device. Signals generated by the sensor mounted on the component case program the fluid prism to instantaneously adjust to the angle and orientation required to cancel image deflection and provide image stabilization. The gyros are powered through a control unit by any 28-volt DC source. A rechargeable battery pack operates for 40 minutes when fully charged. The lens component has a 2½ - to 12-power automatic zoom capability.

Continuing evaluation of the XM76 by units in the field has been promising. The image stabilization allows effective use of the magnifying optics for observation, and the zoom feature allows the observer to search with a wide field of view at low power and then zoom to high power to make a detailed examination of objects of interest without losing view of them. In addition to the tactical advantages discussed previously, several new advantages have been discovered.

RECONNAISSANCE OF LANDING ZONES

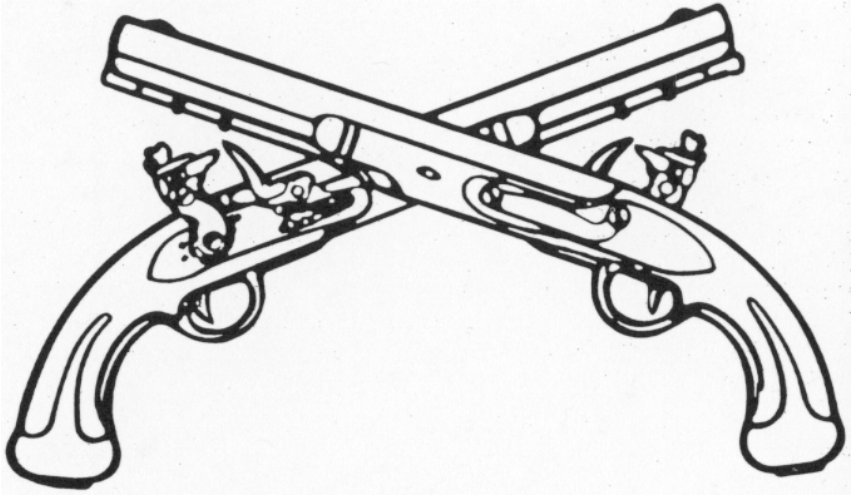
In the past, detailed reconnaissance of landing zones, which is required before troop landings, has been made by circling at low levels. This tactic all but announces an ensuing action to the enemy and gives enemy forces a significant advantage. Using the XM76 system, the commander can make a reconnaissance from a high altitude without circling. A mere overflight of a helicopter at a high altitude is not an indication to the enemy that a landing will be made in a particular place.

Command and control of ground troops are greatly improved with the XM76 system. Brigade and battalion commanders can fly at altitudes above the effective range of small arms and automatic weapons and still positively identify their own units and better observe enemy movements.

The XM76 can be easily adapted to other optical equipment to enhance intelligence gathering capabilities. Interface with night vision devices, handheld television cameras, and movie cameras have proved successful in user evaluations.

At the present, the U. S. Army Field Artilley School, U. S. Army Aviation School, and other Army elements are studying the need for the system as a standard item of issue. Regardless of its acceptance into the Army inventory, the XM76 could be the departure point for the development of an entire family of field artillery observation aids.

AWOL



Duty Bound . . .
Or Duty Bind?

MAJ Clifford Simonsen
US Army Military Police Corps

Editor's Note: *MAJ Simonsen recently completed graduate study at Florida State University and was awarded his MS degree in criminology. This present article is reprinted from the August 1970 issue of the* **Military Police Journal.**

"Dear sir, I am AWOL at this time. I am very sorry but I have, I think, a perfect reason for going."

So begins a 12-page letter to his former correctional training facility (CTF) commander. He had found that the motto of the CTF, "Duty Bound," could also be a "duty bind" from which AWOL seemed the only alternative. It is not significant that "PVT X" ran away from his problems—that has been the pattern of his whole life. He, like most soldiers sent to the CTF, most likely dropped out of school and drifted from job to job until he enlisted in the Army to run away from civilian life. The pattern was only repeated when he ran away from the Army. The big difference this time was the punishment involved for this kind of behavior in the military. Eventually caught and convicted by a court-martial, PVT X was considered to be restorable and was given the chance to be retrained at the CTF and returned to duty. As it is stated in the

CTF mission, the goal of the CTF is ". . . to provide the intensive training, close custodial supervision, and correctional treatment necessary to return military prisoners to duty as well-trained soldiers with improved attitudes and motivation."

No, running away is not new to PVT X. What was significant this time was the fact that something had happened at the CTF to cause him to sit down and write to someone and ask for help. At first glance it would seem that the CTF had failed with PVT X; but did it? What were the conditions met by this man with a long history of running away that made him run again—even after he had completed the rigorous training program at the CTF? Completing the training program was probably the first successful accomplishment in his life. He had acquired enough motivation to report to his new duty station—on his own. What happened then? The situation portrayed in his letter, while far from typical, has been noted enough times to bear further scrutiny. Let us examine it and see if we can determine who failed.

The letter goes on, "I reported to the CQ and I was telling him that I was from CTF and the 1SG walked in and, I quote, said: 'Oh hell, another one of those SOB's'. Well, right then and there I felt I was in trouble."

Wouldn't it be difficult for **anyone** to adjust to that sort of initial reception? But CTF graduates are prepared for a less-than-enthusiastic reception. This is done during sessions involving "roleplaying" prior to completion of the cycle and leaving for an assignment. A member of the cadre assumes the role of a hostile NCO or officer and the trainee learns to take the abuse. **This** first sergeant evidently had practiced the part.

"I DON'T HAVE ANY CONFIDENCE IN ANY OF YOU"

The letter continues, "The 1SG oriented me first. He said, 'I don't want to see you screw up once or you will be out. You guys from CTF never pass the course. I don't have any confidence in any of you'. . ." This would be a little hard for anyone to swallow, but perhaps it is too much to expect from someone who already has so little confidence in **himself.**

PVT X then tried to get a pass. He had been in confinement for 5 months and felt that he needed to relax a little. He was refused, with the curt explanation that they would be "processing" for the next 3 days and there was "no way" to get a pass. Seeking help, he went to the office of the inspector general. He was told to go through his chain of command. That appeared to him to be an obvious deadend, so he "took his own pass." He reported back to the unit (surrendered) after 3 days. He discovered that there had been no "processing," as it had all been completed on the first day.

He reported to an irate first sergeant, who is quoted as saying: "So, the SCUM is back! You know what I should do to you? I should beat your ass all around this post. You might as well go AWOL again, because I'm going to be on your ass from-here on in. Meet me in the

orderly room at 0700 if you want to. As far as I'm concerned, you might as well go AWOL again." PVT X then found out that the company commander **had** written him a 3-day pass, but that no one had bothered to tell him. (Would that have made a difference?)

"DO YOU WANT A DISCHARGE?"

The subsequent interview with the company commander went as follows: "PVT X, you know what I should do? I should recommend you for a discharge. Do you want a discharge?" (One of the primary aims of the CTF is to motivate the trainee to return to duty and earn an honorable discharge. The disadvantages of any discharge other than honorable are emphasized.) PVT X replied, "Not a bad discharge, Sir." The commanding officer then warned, "Well, X, one more wrong move and you will be getting a discharge!"

While waiting in the orderly room, PVT X heard the commanding officer and the first sergeant talking about AWOL's. As they passed him, the first sergeant said, ". . . for example, this man here, and I call him a man only because he is wearing that uniform. He has no guts, probably because his parents raised him wrong. If so, his parents are no good, just like himself!" The writer states that he felt like hitting the first sergeant, or worse. He says that he never felt so low, especially when the commanding officer said, "Yes, Sergeant, it's just bad luck when we get people like that!"

PVT X decided to run again before he did something more serious. As he put it, "Sir, I don't want to see the stockade or any jail again. I wanted to go back to duty to stay, but not to be treated like a dog. Sir, please **HELP** me in some way. As soon as I get an answer from you I will turn myself in, but I will not go back to that company." It is seldom that one receives such a clear and desperate call for help from the other side of the fence.

The purpose of this analysis is not to justify PVT X's actions but to try to determine what caused him to fall back into his old habits. To counterbalance this letter and provide a different viewpont, let's review a few others—some with quite a different message.

"I DIDN'T HAVE A PAST, JUST A FUTURE"

One begins, ". . . I know I had an awful attitude when I arrived at CTF, but it didn't take long to change it. I (now) have the kind of duty station I think everyone dreams of. I arrived Friday morning and they had a partial pay and a 15-day leave all ready and waiting for me. I was told that as far as they were concerned I didn't have a **past,** just a **future."**

A second letter states ". . . These people have treated me fine, with no questions asked. They didn't have a job opening in my MOS, so they put me in special services. I'm real grateful for the help that the CTF has given me."

Another says, "Sir, I have had a 10-day leave. I went home and am now living off-post and getting along fine. In the future I am certain you can help lots more soldiers just like you helped me. In my opinion Fort Riley CTF is one of the best things that the Army could ever have."

The "kind of duty station that everyone dreams of" that the writer referred to is no different than the one to which PVT X reported except for the reception he received. Because of the interest and understanding he received, this CTF graduate does have a future full of hope and promise. The second writer was "asked no questions" but was given a chance to prove that he, too, might have a future that is free from the mistakes of the past. The third writer reemphasized the importance of getting away for a little while and of the pride of coming back on his own. The understanding shown by personnel at the new duty stations in providing them with these chances is shown to be deeply appreciated. Does the kind of reception a man receives make a difference? Of course it does.

RESTRUCTURING A LIFETIME OF HABITS

The CTF graduate has been through a lot. In the short 9 weeks that he has been exposed to an understanding cadre and staff, he has attemped with their help to restructure a lifetime of habits that have kept him in trouble most of the time. In such a short time, a "patchup" job, at most, is all that can be accomplished. But he becomes aware, perhaps for the first time, that someone **does** care about his problems. These problems that sometimes seem so big to him are often simple matters to the experienced NCO's and officers at the CTF. Often it is only a matter of some small administrative detail beyond his limited knowledge that can eliminate a major "hangup" for the CTF trainee. He learns that there he can ask for and receive HELP. The pity is that too many times the sympathetic ear and helpful hands are left behind when he leaves the CTF.

Many recipients of CTF graduates expect them to be either candidates for West Point or a piece of garbage. The simple truth is that they are neither. They are a little bit of everything—the same as all other soldiers. They have the same faults and virtues and they make mistakes and do good work the same as "normal" soldiers. Actually, the only difference between them and other soldiers is that they have been labelled as "criminals" for conduct that would only get a raised eyebrow in the civilian community. Some are able to cope with this label, recognize that it is no worse than a dozen others, and work to overcome it.

When it is understood that these men are really no better or no worse than any other soldiers and when they are treated with understanding, they become very appreciative human beings who will work hard to justify that understanding. This does not mean that the CTF graduate with a certain level of ability will become an overnight genius any more

than will the soldier with the same potential who has not become an offender. But he will probably be motivated to perform at the level of his ability and do as well as his "noncriminal" equals. Lack of understanding may cause him to follow old habits and run—a pattern that brings him more disciplinary problems in the military. On the outside he might be called a dropout or a drifter but he would not be called a criminal for simply running away. If this is recognized, and if extra effort is expended to keep this soldier "duty bound" and not in a "duty bind," few indeed will be in the letters that begin "Dear Sir, I am AWOL at this time. . ."

Systems Review

The second annual Field Artillery Systems Review (FASR) was held at Fort Sill on 9 and 10 December 1970. The Systems Review is a management tool used by the Army Chief of Staff to focus high level attention within the Army on those materiel systems which warrant attention because of priorities, problems, or other circumstances. The theme of the 1970 FASR was "Modernization of the Field Artillery System."

The 1970 FASR was conducted by the Office of the Assistant Chief of Staff for Force Development and hosted by the United States Army Field Artillery Center and Fort Sill on behalf of the Continental Army Command. General Bruce Palmer, Jr., Army Vice Chief of Staff, chaired the two day conference. Among the 22 general officers and 120 other officers and Department of the Army civilians attending were General Henry A. Miley, Commanding General of the Army Materiel Command; Lieutenant General John M. Norton, Commanding General of the Combat Developments Command; Lieutenant General Robert R. Williams, Assistant Chief of Staff for Force Development; Dr. Marvin E. Lasser, the Army's top scientist; and Dr. Wilbur Payne, Deputy Undersecretary of the Army for Operations Research. Twenty-eight representatives of the US Army Field Artillery School attended, headed by Major General Roderick Wetherill, Fort Sill Commanding General and Commandant of the US Army Field Artillery School, and Brigadier General Lawrence H. Caruthers, Jr., Assistant Commandant of the School.

The review consisted of a series of briefings presented by Army staff agencies and major Army commands. The US Army Materiel Command's portion of the agenda dealt with 105-mm, 155-mm, and 8-inch howitzers and ammunition; LANCE; HELBAT; field artillery terminal guidance systems; fuzes and ammunition; survey; and counterbattery/countermortar, moving target indicator radars and meteorology. The US Army Combat Developments Command presentations included increased range requirements; battlefield mobility; rates of fire; lethality of ammunition; ballistic match/similitude; fire direction, fire control integration, and coordination of fire

support; and a program for modernizing field artillery capabilities. Development philosophy was discussed by the representatives of the Office of the Chief of Research and Development. Colonel M. J. Brady briefed conferees on airmobile artillery. Representatives of the Assistant Chief of Staff for Intelligence gave a briefing on Soviet and low intensity threats. The Office of the Assistant Chief of Staff for Force Development presented information on target development (STANO). The US Computer Systems Command presented a lecture and discussion on the new automated tactical fire system (TACFIRE). After each presentation, a representative of the Assistant Chief of Staff for Force Development conducted discussion periods to permit senior attendees to ask questions, and make comments. A summary of the major topics and a discussion, led by General Palmer, concluded the review.

Future issues of The Field Artilleryman will describe some of the developments and modifications resulting from the 1970 FASR.

Figure 1. Army Vice Chief of Staff General Bruce Palmer, Jr., reviews the static display of the Field Artillery Systems Review (1970).

In Every Clime . . .

Marine Corps Artillery

CPT David J. LaBoissiere
US Marine Corps

"Our flag unfurl'd to every breeze from dawn to setting sun; we have fought in every clime and place where we could take a gun!" These words from the second verse of the Marines' Hymn, express a tribute to the expeditionary nature of the Marines and their supporting artillery. Since 1775 the "soldiers of the sea" have maintained their expeditionary posture; they are ready to implement the policies of the President anywhere in the world on a moment's notice. As America's foremost force in readiness, capable of worldwide deployment, we are prepared to land by air or sea in any "clime and place." To provide artillery support for such a mobile land, sea, and air fighting force, we have an array of light, medium, and heavy artillery weapon systems in organizations that complement our missions.

The battalion landing team (BLT) is the basic task organization around which planning for the amhibious assault is usually centered; hence, the firing batteries of the direct support artillery battalions without augmentation, are organized to provide the BLT with supporting fires during the initial phases of combat ashore. The artillery is brought under effective centralized control when the direct support artillery battalion headquarters is landed. As the forces move inland, the remainder of the artillery regiment is landed to provide fire support and coordination facilities for the division as a whole.

Since the Marine Corps' basic mission is to conduct amphibious operations, the units in the Marine divisions are equipped with the lightweight equipment that is easy to land by air, landing craft, or helicopter. This principle holds true for the artillery units that support the Marine division.

An artillery regiment in each Marine division provides the division with supporting fires and fire support coordination personnel. The regiment is organized with a headquarters battery, three direct support battalions, and a general support battalion (fig 1).

Currently, there are three active duty Marine artillery regiments and they are organic to the following divisions:

Artillery Regiment	Marine Division
10th Marines	2d Marine Division
11th Marines	1st Marine Division
12th Marines	3d Marine Division

There is also one reserve artillery regiment, the 14th Marines, organic to the 4th Marine Division (Reserve). It is fully equipped and capable of immediate mobilization.

The artillery regiment is commanded by a colonel, who also serves as the division fire support coodinator (FSC). The commander is assisted in his FSC duties by a lieutenant colonel and a major who operate the fire support coordination center.

Within the regiment there are three direct support artillery battalions that provide responsive fire support to the three infantry regiments of the division. Each direct support (DS) battalion consists of a headquarters battery, three towed 105-mm howitzer batteries, and one 107-mm mortar battery (fig 2).

The artillery battalion is commanded by a lieutenant colonel. He has staff officers to carry out normal staff functions to include both tactical and technical fire direction. The direct support artillery battalion commander normally functions as the fire support coordinator for the

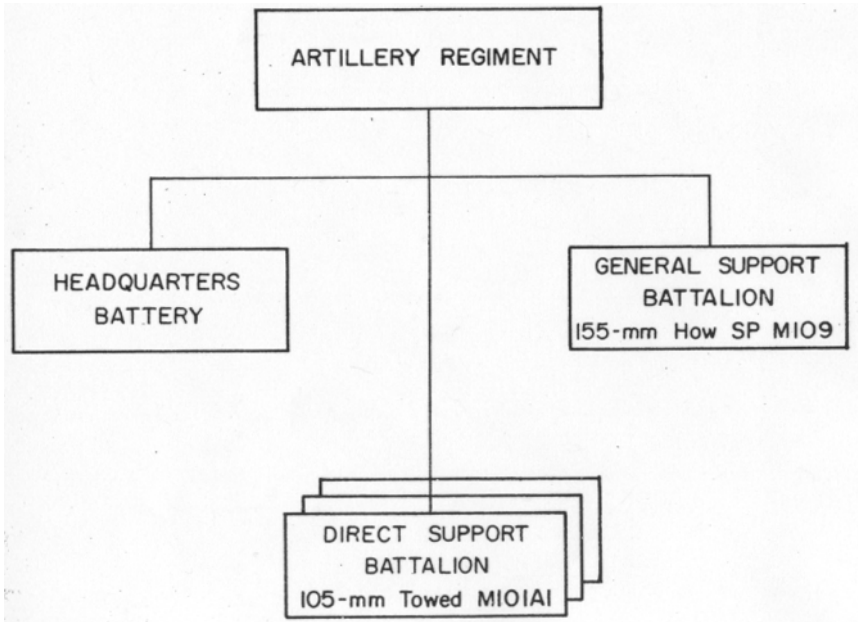


Figure 1. Artillery regiment, Marine division, FMF.

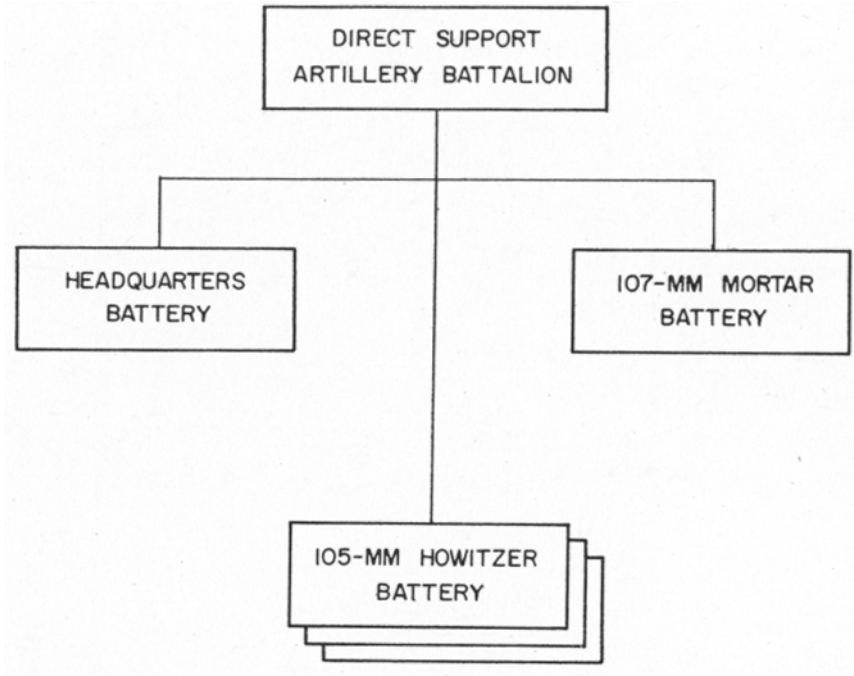


Figure 2. Marine direct support battalion.

supported infantry regiment. In addition to the normal artillery liaison officers and forward observers provided by the direct support artillery battalions to the supported maneuver units, Marine direct support battalions also provide a naval gunfire section to the supported infantry regiment. This section provides the requisite personnel and communications to the supported regiment and its subordinate battalions to request, adjust, plan and coordinate naval gunfire support.

The towed 105-mm howitzer M101A1 is the standard weapon of the three howitzer batteries in the DS battalion. The fourth battery, equipped with the 107-mm mortar, gives the battalion additional flexibility in supporting the infantry and insures that a firing unit which can be readily transported by helicopter is always available.

The general support battalion, which is equipped with the self-propelled 155-mm howitzer M109, provides medium artillery support for the division. The battalion is commanded by a lieutenant colonel and has a staff similar to that of the direct support battalion, except there are fewer artillery liaison and observer personnel and no naval gunfire personnel. The general support battalion is organized with a headquarters battery and three 155-mm howitzer batteries (fig 3).

The Marine division is designed to be a strong yet mobile force capable of being delivered rapidly over land, by sea, or by air. In keeping with this expeditionary concept, the division is not provided with a long-range logistical capability or with heavier pieces of equipment, such as heavy artillery. These heavy items are placed in an organization known as Force Troops. Force Troops is designed to augment the division with the capabilities essential to sustained land combat but not necessarily vital to the early stages of an amphibious operation. The basic artillery organization in Force Troops is the field artillery group to which is assigned a number of 8-inch howitzer (SP, M110) and 175-mm gun (SP, M107) batteries.

The field artillery group (FAG) is designed to provide a command and control unit for the various artillery units in the Force Troops. The group is commanded by a full colonel, whose staff is similar to that of the artillery regiment.

The Marine artillerymen receive their training at the US Army Field Artillery School, Fort Sill, Oklahoma. Marine students are present in sufficient numbers at all times to justify the assignment of some 33 officers and 7 senior enlisted Marine instructors on the staff and faculty of the Field Artillery School. These instructors teach the same courses as those taught by their Army counterparts and participate in the development of doctrine and techniques incorporated in the instruction. In addition, Marines instruct a course on amphibious operations, to include naval gunfire and tactical air support employing Navy and Marine aircraft units. A senior Marine Corps representative, an artillery colonel, represents the Commandant of the Marine Corps at the School. Hundreds of Marine officers and enlisted men attend the Field Artillery School each year. We like to think of the "School of Fire" as "our" artillery school too; and upon completion of a cruise at the School, we are proud to be Fort Sill-trained "Marine artillerymen."

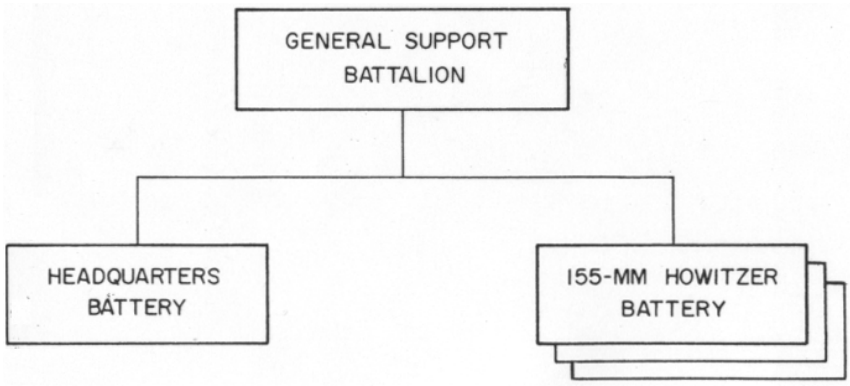


Figure 3. Marine general support battalion.

Noncommissioned Officer Education System

A new concept of career development for enlisted personnel has been introduced into the Army and is now being implemented in the U. S. Army Field Artillery School curriculum.

The Noncommissioned Officer Education System (NCOES) provides career enlisted soldiers with the same opportunities for training, promotions, and positions of increasing responsibility that officers have enjoyed for years.

The Department of the Army hopes that the expanded educational system for enlisted men will—

- Increase the quality of the noncommissioned officer corps.
- Provide noncommissioned officers with opportunities for progressive and continuing development.
- Enhance career attractiveness by providing formal military education.
- Provide the Army with highly trained and dedicated noncommissioned officers to fill positions of increasing responsibility.

As the NCOES courses phase in, the highly successful Skill Development Base (SDB) courses, which have produced skilled noncommissioned officers for the Army since 1967, will be phased out. Although the NCOES courses closely parallel former SDB courses in technical training and leadership development, they introduce some significant differences.

The most important improvement is in the student selection process. Unit commanders will select for attendance the best qualified enlisted men in consonance with their career needs. At the completion of the course, the students will return to their parent units.

The courses are less than 19 weeks in length and consist of an academic phase and a leadership development phase. There is no on-the-job training phase as there is in the SDB courses.

In addition, the NCOES courses are career oriented and are designed to train individuals for duties worldwide. The SDB courses are limited primarily to filling Vietnam requirements.

The entire program is composed of three progressive levels of instruction—basic, advanced, and senior—which correspond to the career development pattern of officers. However, development of the senior level course is being held in abeyance until an evaluation of the basic and advanced levels is completed. Courses at the first two levels will be conducted at all Army service schools.

At the first level, there will be approximately 75 NCOES courses at 12 CONARC schools, with more than 6,000 NCO's enrolled. Two pilot 13B40 NCOES classes were conducted at Fort Sill last summer. The entire first-level program should be operational during FY 72.

At the second, or advanced, level, 91 MOS career courses will be taught to approximately 5,000 NCO's at 19 schools. Fort Sill's four advanced-level courses will be implemented during FY 72.

Specific inputs and course prerequisites are controlled by higher headquarters. A GT aptitude score of 90 or higher is required for basic courses and a GT score of 100 is required for advanced courses. Applicants must have excellent character ratings and must be personally selected by the unit commander. Applicants must have a minimum of 1 year of service remaining upon completion of the basic course and a minimum of 2 years remaining upon completion of the advanced course. Additional prerequisites have been developed for specific MOS's as appropriate.

BASIC AND ADVANCED COURSES

Further information on the NCOES program and basic and advanced NCOES courses listed below to be presented at Fort Sill may be obtained from the Commandant, U.S. Army Field Artillery School, ATTN: ATSFA-DI, Fort Sill, Oklahoma 73503.

Basic courses to be presented are as follows:

MOS	COURSE TITLE
13B40	Field Artillery Cannon NCO Basic
15J40	Lance/Honest John Operations/Fire Direction Assistant NCO Basic
15B40	Sergeant Missile NCO Basic
15D40	Lance Missile NCO Basic
15E40	Pershing Missile NCO Basic
15F40	Honest John Rocket NCO Basic
15J40	Lance/Honest John Operations/Fire Direction Assistant NCO Basic
*17B-C-D-E40	Field Artillery Target Acquisition NCO Basic
31G40	Tactical Communications Chief NCO Basic
82C40	Field Artillery Surveyor NCO Basic

**A multitrack two phase course supporting four different MOS's (17B40-Counter Battery/Counter Mortar Radar NCO Basic, 17C40 Sound Ranging, 17D40 Flash Ranging and 17E40 Field Illumination*).

Advanced Courses to be presented are as follows:

MOS	COURSE TITLE
13Z50	Field Artillery Cannon NCO Advanced
15Z50	Field Artillery Missile/Rocket NCO Advanced
17Z50	Combat Surveillance/Target Acquisition NCO Advanced
93E50	Meteorological Observer NCO Advanced

New Developments in . . .

Night Vision Equipment

Night Vision Laboratory, Fort Belvoir, Virginia

American soldiers who must fight the enemy at night are depending more and more on new tactical night vision devices known as image-intensification systems. Since the removal of their security wraps, these devices are being more widely distributed to individuals and fighting units in Southeast Asia, where they have seen limited combat use during the past few years.

This new generation of night vision equipment has three members—the starlight scope, resembling an oversized telescopic rifle sight, for use on individual weapons; the crew-served weapon system night vision sight, designed for weapons such as machineguns and recoilless rifles; and the medium-range night observation device for soldiers manning listening posts or forward observation sites. The devices also are adaptable for use by naval and air forces.

Figure 1. The starlight scope, used as sight mounted viewer on basic infantry weapons or as a handheld viewer.

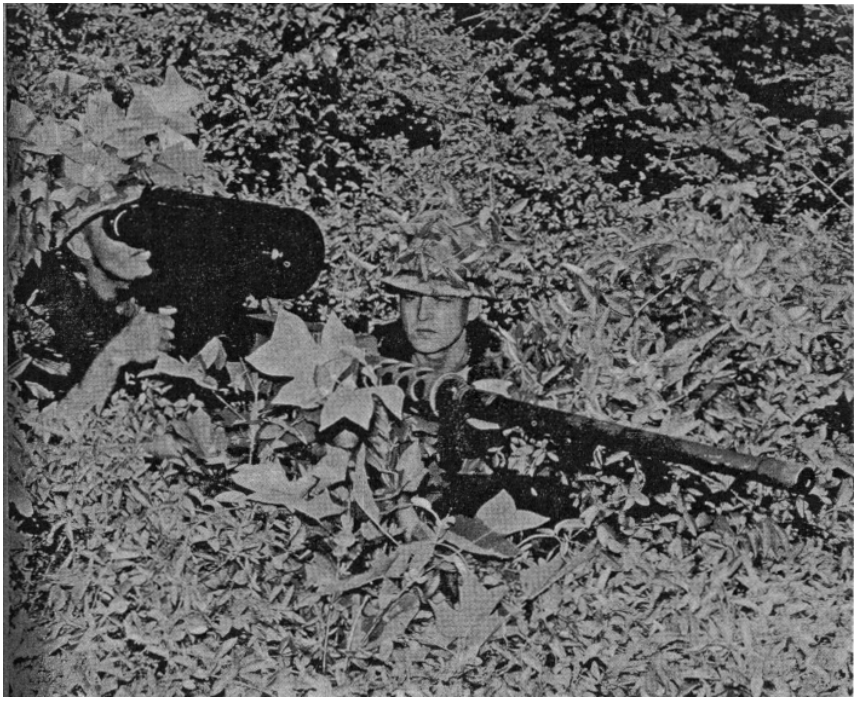


Figure 2. The crew-served weapons system night vision sight.

A major problem in combat always has been that of locating the enemy when he moves and fights principally at night. The most successful approach to a solution until now has been the use of infrared light. This light, invisible to the naked eye, irradiates objects, which then can be seen with a special viewer. The main objection to the use of infrared is that the user can be spotted by a foe equipped with infrared viewers or other detection equipment.

On the other hand, the new night vision devices amplify the dim glow of the moon or stars, or even faint skyglow, and intensify it within the target area of the scope. Since the system is "passive," the soldier using such equipment does not generate a light source. Thus, he does not risk revealing his position to the enemy.

Research and development on night vision equipment and systems for the Army is conducted by the Army Electronics Command's Night Vision Laboratory at Fort Belvoir, Va. The laboratory's efforts have resulted in the development of these latest tactical night vision devices with which US fighting men may draw a clear, bright bead on the enemy in the dark.

The heart of the new night vision systems is the image-intensifier tube which works in the following manner:

What little light there is from the night sky hits the end of the tube. A fiber optic—a bundle of individual glass fibers—traps the light, bringing it into the tube, where it strikes a photoemissive surface.

The tube then discharges electrons into a vacuum. These electrons, energized by 15,000 volts of electricity, strike a screen similar to a television picture tube and give off light.

This process is repeated twice, and the electrons are so energized that when they strike the final screen, near the eyepiece, the image is 40,000 times brighter than when it entered the tube.

These new electronic viewers, now in the hands of tactical units in the field, are vitally needed by our soldiers keeping an eye on enemy troop movements in the dark. In fact, the devices have so enhanced the efficiency of the rifleman that he need now carry only a fraction of the ammunition load required before.

The concept of these new night vision systems has been made a reality through rapid developments in techonology achieved by ECOM's

Figure 3. Medium range night observation device.

Intensifier Tube

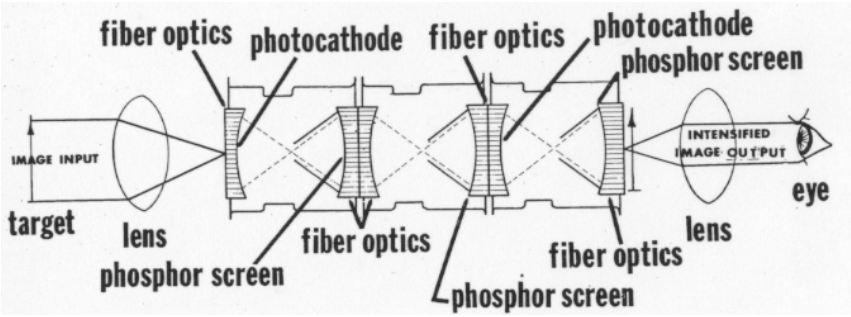


Figure 4. Detail of internal system of image intensification.

Night Vision Laboratory, spurred on by the urgent need for such equipment in Southeast Asia.

Research and development for equipment capable of detecting and recognizing military targets at night is all inclusive. It is based on the guidance from military users and combat development agencies with whom close contact is maintained.

A continuing analysis of advances in electronics, optics, biochemistry, and other fields is conducted, and studies of the individual soldier are carried on. Field tests are held to determine the factors affecting the design and use of the night vision devices.

New techniques and materials resulting from the research program of the Night Vision Laboratory are incorporated as rapidly as possible into simple, rugged equipment designed to meet the requirements of the military user.

HISTORY OF NIGHT VISION RESEARCH

Throughout the history of armed conflict, the cover of darkness has provided a tactical advantage for one side or the other. The earliest recorded efforts to remove this cover consisted of the use of torches, flares, and rockets. During World War I, formal research was started in the area of night vision. Until the 1930's, however, research was confined to searchlight illumination.

In the '30's, early television research led to the development of an image tube that could be used to convert infrared images to visible displays. The military significance of this was quickly recognized by the Army, which developed the sniperscope of World War II.

A natural outgrowth of infrared research was exploratory work on a cascade image-intensifier tube and other viewer components for low-light-level image intensification. But actual development of the image-intensifier tube did not come about for another 15 years.

In 1955, Army Warfare Vision personnel began to develop light-amplifying tubes which would not require the cumbersome, power-consuming infrared light source. Their goal was to enable the soldier to fight more effectively at night with a passive viewing system virtually undetectable by the enemy.

TWO-STAGE CASCADE IMAGE-INTENSIFIER TUBE

Night vision scientists in 1957 produced and successfully demonstrated a two-stage cascade image-intensifier tube, and funds were allocated to permit them to continue their efforts.

The big break in night vision research came in 1961 when a special presidential advisory committee identified the lack of a night fighting capability as a serious drawback to the Army's preparedness for limited warfare. The following year the night vision program underwent rapid expansion.

On 2 November 1965, the program was transferred from the Army Engineer Research and Development Laboratories to the Army Electronics Command's Combat Surveillance, Night-Vision, and Target Acquisition Laboratories complex.

At the same time the Army Materiel Command, parent organization of ECOM, created a night vision project manager's office at Fort Belvoir to speed production of equipment as warranted.

RESEARCH AND DEVELOPMENT

Under ECOM, the Night Vision Laboratory was assigned the mission of research and development of night vision equipment and systems that use reflected radiation. These include devices utilizing low-light-level image-intensification, infrared, and battlefield illumination systems, and self-emitted radiation equipment which detects and projects images of military targets by virtue of their temperatures.

With the necessary resources provided, the laboratory maintained an accelerated pace over the next 4 years which resulted in—

- A first generation of night viewing systems based on the state of the art as it existed at that time, which gave the Army the starlight scope and the night observation device.
- Research on second-generation equipment to be based on greatly improved tubes, lenses, and power supplies that are less costly, smaller and lighter, and designed to outfit the entire Army.

The Field Artilleryman
A Military Polyhedron

Military what?? No, it isn't a new MOS or fancy piece of electronic equipment. Polyhedron means many-sided and is normally used to describe a building. The word does, however, apply perfectly to the field artilleryman. No other branch of the Army requires a man to develop as many talents or to become proficient in as many subjects as does the field artillery.

The field artilleryman must be many things. He is required to be physically fit, mentally alert, and continually aware of his military bearing. These attributes he has in common with all soldiers, but here the similarity ends. The field artilleryman is responsible for the delivery of timely, accurate, and devastating fires in support of the ground-gaining arms. This responsibility is exacting and awesome. Being the eyes, ears, and brains for weapons systems that range from light howitzers to huge surface-to-surface rockets and missiles requires intensive training. A mistake is intolerable, for the consequences may be shattering.

What are the many sides of a field artilleryman? He is a tactician who must fully understand the capabilities and limitations of those for whom he fires. The speed and mobility of modern infantry and armored units demand that he be fully cognizant of all structure and maneuver concepts of the ground-gaining arms. He must know air mobility and amphibious operations, for these are inherent in his tactical mission. He must fully understand the logistics and the jargon of those whom he supports. In short, his first side is that he can think and act the role of his infantry and armor counterparts.

As an artilleryman, he lives by the creed of being able to "shoot, move, and communicate." This is his foundation, and from here the "sides" are erected. He must master mathematics to learn gunnery and fire direction. He lives with the word "exact," because a single error on his part can cause unintended death and destruction.

He must move and communicate. He may move on wheels or on tracks; by air or by water. He comes to be expert in maintenance, for he must always be able to follow those whom he supports. "Slings, clevises, and doughnuts" and all the other jargon of airmobility are part of his vocabulary. His guns will be carried by helicopters and fixed-wing aircraft, and he must understand loading, weight ratio, and cubic displacement. He will fire from barges and fixed water platforms, so he learns the ways of inland water sailors. An old and honored tradition is that the artilleryman never walks. It may be true that he rarely does, but the knowledge he must absorb to understand his myriad transporters is a fair price to pay for the luxury. To move and to shoot requires yet another facet in the polyhedron called the field artilleryman.

He must be able to communicate. He will use wire, voice, and radio, and he must be expert in these media. His commands and calls for fire will be through some communication device, so mere familiarity is not acceptable. He must know the operation, field repair, and maintenance of each piece of communication hardware he uses. He must be expert in procedure, because his messages, and those he receives, must be clear and easily understood. Here, too, he must be precise.

This sounds like a lot to do, but it isn't all by a long shot. He is committed to accuracy, so he must employ all the means at his disposal to achieve it. Here he becomes a quasi-technician. Precise data is his desire, so he learns survey as both operator and employer of the data gathered. He becomes an expert map reader because he must know where he is and where his supported elements are at all times. Interior and exterior ballistics become familiar to him. He understands meteorology and how it effects his projectiles. He knows his weapons system and the munitions he must deliver through them. His knowledge of ordnance must continually grow because he must fully understand his guns and their particular capabilities and limitations. He must locate his targets; therefore, target acquisition proficiency joins his legion of talents.

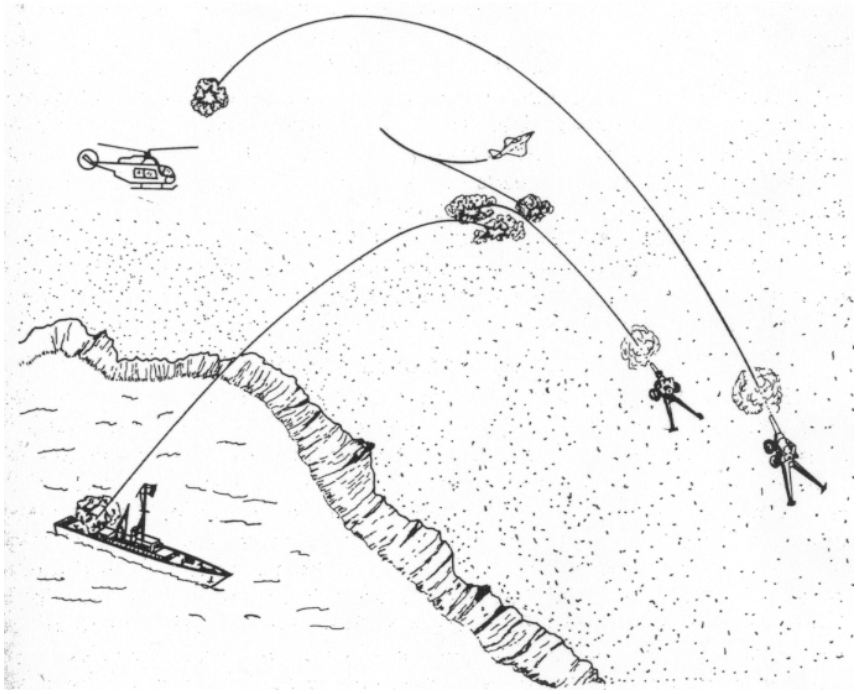
This isn't all. He understands civil affairs because he will be called on to use this knowledge. He must understand CBR for two reasons: His weapons can deliver this method of warfare and, conversely, as a combat soldier he will be the target of counter-system to neutralize his gargantuan lethality.

To say that the field artilleryman is many-sided might be an understatement. Each of these talents can be divided and subdivided again and again according to the degree of proficiency required. The field artilleryman never stops learning. The very nature of his profession demands he be both qualified and current.

How does he meet these many demands? The excellent resident courses presented by highly qualified instructors are famous throughout the Army for their completeness and comprehensiveness. If duty or location prevents his coming to Fort Sill, he can still maintain his proficiency through the Extension Courses Division of the Nonresident Instruction Department. Serving all the active armed forces as well as the National Guard, Army Reserve, and selected civilians, this department teaches by mail. Professional authors coupled with an efficient administrative and logistical staff insure that the "absent" artilleryman receives the newest data regardless of his location. The correspondence courses offered by this department cover all areas of field artillery and related subjects as well as selected common subjects.

If you are a field artilleryman, you may be justly proud of your skills. If you want to become a "Redleg," you are making a wise choice. If you need to review or if you just feel like learning about something new, let Extension Courses Division, Nonresident Instruction Department, Fort Sill, Oklahoma, assist you. Just write or call us to start building or adding a few more "sides" to your career as a field artilleryman.

AIRSPACE CONTROL AND FIRE SUPPORT OPERATIONS



LTC (Ret) Charles W. Montgomery
Tactics/Combined Arms Department, USAFAS

Until recent years, the Army's need for airspace immediately above a combat area was limited to the airspace required for fire support operations and for limited air traffic by Army aviation. Rarely did this need conflict with or impede the planned or spontaneous air activities of other services. However, with the advent of airmobile operations, which require the wholesale use of Army air vehicles, the Army's need for airspace has greatly increased. This increased use of airspace by air vehicles poses a serious challenge to the effective and timely use of fire support. In fluid combat operations, such as those which currently prevail in Southeast Asia, it is not uncommon for a field artillery unit to be firing simultaneous indirect fire missions in several directions from a single firing position while aircraft are moving overhead through the area. In some situations, lucrative targets cannot be fired on because of

the presence of aircraft in the immediate area of the target location. The airspace previously dominated by fire support elements (field artillery, naval gunfire, and direct aerial fire support aircraft) is now often needed by Army aircraft for the transport of personnel and material throughout the area.

A system for controlling airspace within the combat area is needed to insure the safety and effectiveness of friendly aircraft and the effective and timely use of all fire support available to a ground force commander. Presently, a ground commander is responsible for all that occurs within his assigned area of operations, which is usually defined by boundaries on the ground. However, because of the various aerial and ground fire support means normally available in today's combat operations, the ground commander also needs a vertical boundary. This boundary should extend upward to the altitude beneath which the available fire support means will be employed. The assignment of the responsibility to the ground commander will insure unity of effort and allow the development of rules for the use of such airspace. The rules developed will insure the most effective use of the airspace by the Army.

"THE TAIL WAGGING THE DOG"

Because the field artillery is charged by Army regulation (AR 10-6) to provide the expertise for fire support operations and because fire support systems are the most constant users of the airspace immediately over a combat area, the resolution of airspace authority is critical to the field artillery. If the use of all airspace were controlled by someone other than a ground force commander, it follows that fire support might not be sufficiently responsive to the immediate needs of the ground forces. Under such conditions, the execution of fire support would be dependent on a prearranged clearance from an "outside" airspace authority or all fires would have to be cleared as targets develop. The imposition of such a clearance requirement would be viewed by a fire support coordinator as a case of "the tail wagging the dog."

Under present Army doctrine, fire support is normally coordinated by the senior field artilleryman present with a ground force. At maneuver battalion and brigade headquarters, this coordination is accomplished within a fire support coordination center (FSCC) whereas at division and higher echelons it is accomplished within the fire support element (FSE) of a tactical operations center (TOC).

Airspace control by the Army is now exercised through an airspace control element (ACE) of the TOC at division and higher echelons. The ACE is manned by air defense artillerymen and aviation representatives. There are no airspace control elements at echelons lower than a division.

Centralized control of airspace is complicated by the fact that airspace control and fire support control are accomplished by two separate elements within the TOC. At echelons below division, there is no existing system for centralized airspace control.

The ever-increasing need of the ground force commander for uninterrupted use of airspace immediately above his area of operations requires that the present airspace control system be improved. Such an improvement should provide for a single management facility in which all major users of airspace (fire support, air defense, and aviation) are represented. This facility should be available to units down to and including the maneuver battalion. This would provide the ground commander with a single advisor on the best use of his assigned "block of airspace" commensurate with the resources available and the mission to be accomplished. Second, it would establish a single advisory service for determining safe aerial lanes through an area of operations and for guiding aircraft through those lanes.

REQUEST FOR PHOTOGRAPHS AND SLIDES

The Survey Division, Target Acquisition Department, US Army Field Artillery School, conducts training for approximately 4200 officers and 4000 enlisted men annually. Graduates of these courses are programmed to fill a wide variety of positions in the area of field artillery survey. While formal programs of instruction are used to present the technical aspects of field artillery survey, efforts are also made to provide an awareness of potential field environments in which the students may find themselves upon graduation (i.e., combat, jungle, mountain, arctic operations, etc.). These facets are covered by special orientations, use of instructor experience, and pictorial displays.

To present the most up-to-date pictorial displays and visual training aids, the assistance of units in the field is solicited in providing photographs or slides depicting actual survey operations in typical situations. These items should include unit, location, and date taken. Forward items to the Commandant, US Army Field Artillery School, ATTN: ATSFA-TA-SV, Fort Sill, Oklahoma 73503.

CHANGE TO ARMY TRAINING TESTS

Review of ATT 6-155, dated 5 January 1970, ATT 6-157, dated 9 July 1970, and ATT 6-165, dated 6 October 1970, reveals that the standard for timeliness of computation for the nuclear mission (155-mm) met correction technique is incorrect. The following standard should be used—

- 0 to 20 minutes—excellent.
- 20.1 to 25.0 minutes—satisfactory.
- Over 25 minutes—unsatisfactory.

This correction will be included in future revisions to the ATT's.

Organizational Demands
and
The Modern Executive

Peter F. Drucker

Editor's Note: *Dr. Peter F. Drucker, Professor of Management, New York University, and a noted authority in the field of management, holds a doctor of laws degree from the University of Frankfurt (1931). He has been awarded honorary degrees by a number of American universities and the Nihon University, Tokyo and has also received a number of international awards in management. Dr. Drucker is a Fellow of the American Association for the Advancement of Science, the Academy of Management, and the British Institute of Management. He is the author of several books, including* **The Effective Executive** (*1967*) *and* **Age of Discontinuity** (*1969*), *as well as articles for such magazines as* **Harper's** *and* **New York Times Magazine.** *This present article is reprinted from the July 1970 issue of* **Perspectives in Defense Management,** *which is published by the Industrial College of the Armed Forces, and is based on a presentation by Dr. Drucker to the College on 6 February 1970.*

I think all of you must be aware that you are a transitional generation in the management of the military forces of the United States. The generation I knew and have worked with was the World War II generation in terms of service. Many of them went into the Service well before the war. It was a totally different military service. I am sure you have all heard stories about it, but I doubt whether you can imagine how it really was.

Men of that generation were formed professionally during World War II and in the unification period immediately following. You, I take it, are primarily a Korean War generation in terms of military service. And when I call you a transitional generation, I mean that you grew up in a military service that was learning many new things, a generation that was learning to live with **size,** beyond anything ever experienced in peacetime, and with **complexity** never seen before in peace or war.

But for the most part, the armed services were still organized—and, incidentally, very effectively organized—on principles that one could trace back to Elihu Root in the early days of the century.

Your successors, who are now in Vietnam, will come up in a very different setting, with a different technology, different concepts of professional formation, different concepts of the role of the military executive in our society. And, as all of you know, the rules of the game are probably changing too, and I am not just talking of budget cuts.

You are, in a way, still products of the last 30 years and you will have to manage in a rather different environment. I am not talking of the computer, which is only a visible symbol of the new environment, but more generally, of a whole new world. For instance, the relationships between the foreign policy of the United States and its military policy—which, in many ways, have been very simple over the years—are almost sure to change. And the position of the military in civilian society is going to change whether we switch to an all-volunteer army or not.

"YOU WILL BE EXPECTED TO BE SCHIZOPHRENIC"

And so the pressures on you, while not predictable, will probably be much greater than they were on your predecessors, and greater than they will be on your successors. You will be expected to be schizophrenic. You will be expected to live in several worlds at once, and that is a real strain. So the premium on being able to manage yourself will be very, very great.

My first exposure to what is now the Pentagon was on the day after Pearl Harbor, and, welcome or unwelcome, I have been in and out ever since. Before World War II, a military officer was not expected to be an executive—except for a very few who, in effect, transcended military service by running outfits like the Civilian Conservation Corps. Within the military, by and large, one did not expert even general officers to be executives, partly because jobs in the military establishment seemed to be clearly defined, and therefore were thought to need no particular managerial expertise, and partly because they looked to be totally different from jobs in other institutions.

All of you know that this is no longer true. While the military is still the military, and is and should be a very distinct institution, it is also a part of society, much more so than any military system this, or perhaps any other, country has ever had. The key jobs therefore are very different from the traditional troop command jobs. So the demands on midcareer officers for managerial effectiveness are very great.

"WHAT ARE THE ELEMENTS OF EFFECTIVENESS?"

Today I shall not talk about the specific tasks of the military, of which you know a great deal more than I do. Let us simply look at the question: What does a military executive have to be able to do in order to be effective? What are the elements of effectiveness?

Some of you know that I have been concerned for a long time with the effectiveness of executives. But perhaps you don't know that this concern goes back to the days when I was a singularly ineffectual executive in the Washington establishment. Early in 1942, Uncle Sam in his wisdom made me an executive. I had been a newspaper man, I had worked in an investment bank, and I had taught in college—all areas in which one is essentially just an individual. Suddenly I found myself

running fairly large, in fact, very large organizations. And I was not only singularly unhappy, I was singularly ineffectual. I got nothing done. Occasionally I was bailed out by my secretary, an old battleaxe, gray in Government service. With her help, sometimes I could get something done. But when they took her away from me, I might just as well have left town.

For various reasons which need not concern us here, however, I stayed on. Washington was a busy place in those early days of the war, full of converted civilians doing all kinds of Government work. Some of them were exceedingly effective, but most of them were no better than I was, and some were simply unspeakable. The interesting thing was that there was no correlation between effectiveness in that environment and previous executive experience.

One of the most effective of those instant executives was a former playwright, Bob Sherwood, who ran the Office of War Information, not an easy job. He was unbelievably effective. Here was a playwright, a man whose managerial experience probably had been limited to his typewriter, heading an organization of 200 reporters. Believe me, there is nothing less manageable than 200 reporters. But he made the thing work.

And so I began to ask myself, what makes an effective executive? Since that time, I have been a management consultant. I work with people in business, in Government, in hospitals, in universities. And I have kept asking this question. So let me report to you some of my findings—or, to use a less pretentious term, impressions.

"THERE ARE NO NATURAL EXECUTIVES"

I will start out by saying three things that may shock you—at least I hope they will. The first is that there is no correlation between effectiveness and any other characteristic. I have seen brilliant people who were totally ineffectual, and rather modestly endowed ones who were very effective. There is no correlation with knowledge. You can be quite ignorant and yet be an effective executive. There is not even a correlation with personality. Some of the effective executives I know are warm and friendly and outgoing, while others are cold and hostile and introverted. Some are honest and others aren't quite. Some are hard workers and others take it easy. I see no correlation between personality and effectiveness. It seems to be a largly independent variable.

My second shocking point is that there are no natural executives. Executives are largely made, not born. They learn their craft. I am not saying that one may not have more talent for being an executive than another. But, in the last analysis, talent won't carry you. Executives who depend on talent are not very effective. Those I know have all acquired certain basic habits of effectiveness, which they had to learn in the way one learns other habits—simply by practicing until it comes out of the ears.

None of you learned the multiplication table by being a mathematical genius—that is, if you learned it, which I very much doubt. My experience leads me to believe that this is one of the better-kept secrets. If you learned it, you learned it because you were drilled and drilled and drilled until it became a conditioned reflex and you no longer had to think. When somebody says, "How much is 6 times 6?" you can come right back and say "72" every time.

Finally—and maybe you already know this—the number of effective executives is small, shamefully small. Perhaps my standards are too high. I myself am not very effective. As an executive, I'm strictly ineffectual. But I must set high standards because I am a consultant working with clients, and a consultant depends on his client to produce results. By himself, a consultant is a cost center and nothing more. It is the client who converts his costs into results. And since I like to see my work produce results, I may demand too much.

"STUPID MEN IN HIGH PLACES ARE NOT COMMON"

But even by lower standards, the number of effective executives would not be very great. Truly stupid men in high places, believe me, are not common. There is an old mountaineer's proverb that the wind blows cold above timberline. The weaklings just don't make it. Oh, you find some awfully narrow people in high places, but truly stupid ones are not common. Stupidity is not a major problem, and neither is ignorance. Most men work pretty hard to learn what they have to learn. In industry most of them work too hard. But effectiveness—that is, getting the right things done—is very uncommon. I would guess that one effective executive out of 20 might be too high. One out of 100 may not be too low.

This is a terrific waste, not only of ability and knowledge but of time, everybody's time. If I am not effective as a consultant, I waste only my own time; but if you are not effective as an executive, you waste the time and energies of your people as well as your own. You are a minus. I am only a null, but you are a minus.

So it is terribly important to learn how to be effective. For you it is especially important, because you are moving into a situation in which it will be very hard to be effective. In a period of changing demands, changing yardsticks, and changing structures, it is difficult to be effective.

"WE CAN'T LEARN FROM FAILURE—WE LEARN FROM SUCCESS"

Long ago I learned never to spend any time dissecting mistakes and failures. We can't learn from failure. We learn from success. We learn from the things that work, not from those that don't work. (This is one reason why I would never have made a good accountant.) And the things that work are the exception. Murphy's law—"Whatever can go wrong, does"—is one of the few absolutely proven laws of nature.

Murphy's second law—which you probably know even if you have never heard it formulated—"When one thing goes wrong, everything else does"—is also a well-documented law. So things that work are the exception, and one can only learn from the exception. For 30 years, I have focused my attention on those executives who seem to get the right things done.

KNOW WHERE YOUR TIME GOES

The first characteristic of the effective executive is that he knows where his time goes. He doesn't control his time, mind you. Any good executive knows that his time is managed by outside forces over which he has only limited control. When the boss or the client calls, one has to go. So, if the executive hasn't much control over his own time, the next best thing is to know what happens to it. Because if he knows that, then he can manage much more effectively the little time he does control. One can double and triple one's effective time just by not doing things that really don't have to be done.

If I followed that rule, I wouldn't be here today. I would be at home working. But since I am a consultant, not an executive, I can tell you, "Do as I say, not as I do." You will have only a limited amount of time in which to do the important things. The pressing things, which are often less important, will take most of your time, even though few of them will contribute much to the achievement of your objectives. That's the way it is.

But the effective executive knows at least where the time goes. He knows, he doesn't guess. He makes sure that a time schedule is kept on what he does and when. And he doesn't keep it himself—do you know anybody who doesn't cheat at solitaire? He has his secretary or the company clerk keep it. Then he looks at it frequently just to see how far he has allowed himself to drift—taking on things that don't need to be done, things that somebody else can do just as well or better, things that will go unnoticed if not done, things that are commonly done only as a substitute for right organization.

"PEOPLE WORK OR THEY MEET"

This last is the greatest time-waster—using time to compensate for poor organization. The symptoms are easy to recognize. The moment you find that you are spending a lot of your time in meetings, accept the fact that you are badly organized. A well-organized organization meets very rarely. People work or they meet. They can't do both at the same time.

So what do you do about it? Maybe you can't do anything be cause your organization is not under your control. Or maybe you will find that the reason you are in trouble is that you are using your good

men, including yourself, to bolster your incompetents instead of promoting them out as fast as you can. But if you find you are having a lot of meetings, accept the fact that you are not well-organized, that the work is not being done where it should be.

The second characteristic of the effective executive is that he is upward-focused, not downward-focused. In this respect, incidentally, you in the military are far ahead of the rest of us—and the universities are far behind. Back in 1942, when the Government in its infinite wisdom made me a consultant on organization for production, a veteran consultant to whom I went for advice gave me two very good tips. "When you go into a plant," he said, "if everyone is rushing around and the place is humming with activity, you can be sure it is mismanaged. If it is quiet and no one seems excited, that's a sign they know what they are doing. They anticipate crises instead of fighting fires."

Well, I have yet to find a plant that is well-managed by that criterion, but he was right. And the same could be said about organizations.

"WHAT EXACTLY DO YOU DO TO EARN YOUR PAY?"

His second tip brings me to my point about the upward-focused executive. "When you get a new consulting assignment," he said, "talk to the top people in the organization and, after you have chatted a while and broken the ice, ask them this direct question: 'What exactly do you do to earn your pay?'"

This is not a popular question, believe me. My consultant friend told me he had been asking it for 25 years and had never gotten a straight answer. And neither have I, for that matter.

The usual answer is something like, "I supervise 4,000 people." That's not a job; it's an affliction. Executives who think like that are task-focused, work-focused, effort-focused. How often do you find an executive who will say, "My job is to make sure top management is prepared for the decisions it will have to make 6 months out"? Or "My job is to give managers the information they need to manage"? Not very often. The man who thinks in terms of his contribution, who looks up instead of down, is a very rare bird.

The disease is worst among engineers. How many engineers do you know who will tell you, "My biggest contribution is to design a product that can be manufactured and that will sell"? Engineering we are very good at. But nobody can make the stuff we engineer and nobody can sell it.

So people tend to think in terms of effort and work and their own specialties. They don't think in terms of the contribution or results. The effective executive does.

More important, he makes his people think in those terms. Try this disconcerting trick. Call in the people who report to you and say, "Look, gentlemen, every one of you has 16 or more years of expensive education behind him, amounting to a social investment of, say, $50,000 or $100,000 or thereabouts. You are all over 21. So I am not going to tell you what to do. You sit down and think through what this outfit should expect from you, by way of results, over the next year. Why should you be on the payroll? We didn't hire you because we have a mystic faith in quality control (or whatever it is they do). What does quality control contribute to our operation? What should it contribute?"

FOCUS ON RESULTS

They will be very upset if you do this. It has never occurred to them to ask these questions. They want **you** to tell **them.** In the military, let me say, you are ahead of the rest of us. You have been asking questions like this for a long time. But this is a battle that is never won. You have to work constantly to get people to focus their vision on achievement and contribution and results, in order to keep them from bogging down in procedures and work.

You will never run out of work, incidentally. There is always more where that came from. One doesn't set about creating more work. The aim is to create more results.

One further thought. When you have thought through your own contribution and desired results, go to your superior and tell him. It's amazing how many people act as though the boss were a mindreader. He is not. In fact, whether you are in charge of a data processing installation or a maintenance base or a logistics command, he probably has absolutely no idea what you perceive as your real contribution. He may think of it in budget terms, while you think in terms of keeping as many aircraft in operating condition as possible. The two are not necessarily compatible, at least in the short run. They may be in the long run, but nobody has ever lived that long.

In other words, what you are saying to him is, "The measurement of my performance is not my own budget, but the budget of the 9th Air Force, for which I get no credit." You will be surprised how often it is possible to change the system of measuring performance so that it will reflect real objectives. So tell him about it. Unless you do, he's not likely to guess; and if you do a magnificent piece of work and he has no idea what you are doing, he may be thoroughly baffled.

And it's not only your boss who needs to know. It's also the fellow across the hall, or in another base, who receives and uses what you produce. For him, it is very important to know what **you** think he needs. He may come back and say, "Look, this is nice but it is not what we need at all. Theoretically you are right; practically you don't know our situation." He is like you. He thinks you are a mindreader. So you must focus upward and outward, and then make sure you are understood.

You in the military have an advantage here. The system of rotating a man every 3 years or so has certain drawbacks, but it does give each of you some notion of what the others throughout the system are up to, what their problems and needs are, and under what conditions they operate. The fellow who depends on your output, or on whom you depend for his, is not an unknown quantity to you. You probably know something about his operation; you may even know him. So the military suffers less from this lack of lateral communication than private industry does—and, by the same token, the civilian agencies of the Government suffer more. They are the worst offenders.

SETTING PRIORITIES

The effective executive does something else, something that looks, and is, very simple and yet is very hard to do. He sets priorities and sticks by them.

If I asked all of you separately to list your priorities for protecting the security of the United States, I venture to predict that you would all come up with pretty much the same list. I am not saying that everybody would have the same first, second, and third items. I do say that there would be a fairly close resemblance among the first 10 items on all 180 lists. We do not have too much difficulty in agreeing on the big priorities. The debate over national priorities is over the relative position of the few top items; everyone agrees on what they are.

What is difficult is to agree on **posteriorities**—the list from number 5 to infinity, which may never get done at all. We try to do a little bit of everything, and in the process we do nothing well because the secret of performance is concentration of effort. The larger the organization, the fewer things it can do at once, simply because of the difficulty of communication. When there are 10,000 people who must be informed of a change in direction, the people far down the line don't get the word until long after it is too late for them to change course. The larger the organization, the greater the need for concentration.

CONCENTRATION IS THE SECRET OF EFFECTIVENESS

One of the great masters of concentrated effort in American military history was General George Patton. It was my job, for a brief period, to serve as liaison officer between General Patton and a civilian agency. He was not an easy man to communicate with, particularly if you had to say "No" occasionally. He banned the word absolutely—from other people's vocabularies. Yet one could not help admiring the man for his capacity to decide on the one most important thing to do, and then doing it. Once he decided on it, he pursued it to the end, without deviating, absolutely ruthlessly. When it came to achieving objectives, he was an S.O.B. of the first magnitude. Nothing could deter him from doing one thing and only one thing at a time. This doesn't make for

comfortable relations with other people, who may have different objectives. But it does make for magnificent performance. Maybe it's not necessary to be as ruthless as Patton was. But concentration is unquestionably the secret of effectiveness. When you look closely at those few people who apparently manage to get a lot done, you will find that they are really monomaniacs. Actually they do one thing at a time; but by working at it full time, they get it done quickly and go on to the next job.

Another thing: These effective executives don't set their original priority list in concrete. After finishing Priority One, they take another look at the list, and maybe they will do some reshuffling of the items. Because after Priority One is completed, the whole situation may look different.

And so concentration, the ability to put aside the interesting and popular tasks and do the one most important task **now,** is one of the secrets of effective management. Good work requires concentration. It cannot be done in driblets. It is done by sitting down (or standing up) and really working at it.

"THE EFFECTIVE EXECUTIVE BUILDS ON STRENGTH"

Finally, the effective executive builds on strength—the strength of his subordinates and of his boss. This is one of the secrets of the remarkable success of Japan, a country in which I've spent some time and which has both fascinated and baffled me. The Japanese quite clearly build on strength. They have lifetime employment; you can't fire anybody. Until age 45, promotion is by seniority; therefore nobody pays any attention to what a man cannot do. You're stuck with him. Well, you might transfer him into the General Affairs Office, where they put the hopeless incompetents; but for the most part, you are stuck with what you have. You use the competent ones to get things done, and you live with the others. In the same way, you are stuck with the boss. It's very difficult to change bosses, so you maximize his strengths and make the best of his weaknesses. This is why this incredibly complicated, creaky, rigid organization in Japan achieves and succeeds. The Japanese lean hard on their good people. The others they put up with.

GENERAL MARSHALL

You can see the same thing in General George Marshall. This man was one of the great builders and choosers of men. Did you know that just before we went into World War II, there was not one general officer of the United States Army under 60, including General Marshall? He moved up a whole new team of younger officers—mostly untested and little known—and he picked almost all of them himself, and practically all turned out first-rate. This was a fantastic achievement, almost without precedent in the history of administration, military or civilian.

How did he do it? For one thing, he accented the positive. "What can this man do?" he asked, never "What are his failings?" But he was also ruthless. If a man made a mistake, he pulled him out immediately, believing that his first obligation to the troops was to give them the best available leadership. There was no room in his command structure for incompetence or even mediocrity.

"ALL RIGHT. BUT DO YOU KNOW ANYBODY ELSE WHO CAN LEAD TROOPS THE WAY HE DOES?"

It was no secret that he was not terribly fond of George Patton. Marshall was highly disciplined, reserved, essentially a shy man. He had little liking for swashbucklers like Patton, who were always in the headlines. But whenever anybody complained about Patton, Marshall would say, "All right. But do you know anybody else who can lead troops the way he does?" That was the end of it. He supported Patton, and others like him, whom he neither liked nor fully approved of, but who **performed.**

Every effective executive I have known does this. He looks for strength up and down the line, and sideways too. And he doesn't worry too much about what people cannot do. He looks for what they excel at doing, and then works them to the limit doing it.

Subordinates, associates, bosses, and children have one thing in common: By the time they get to us—or we to them—it is really too late. We are stuck with them, and they with us, and we can't change them much. In the military, particularly, you have very little influence on the selection and assignment of your subordinates, even less your associates and bosses. That is governed by a mysterious process which no outsider understands (and, I suspect, no insider does either).

As far as your subordinates are concerned, you have to live with them and try to make them perform up to their full capacities. It doesn't help you very much to write a poor efficiency report on a man. In fact, you know very well that you had better not write too many, because that reflects on you. Most good executives manage to make their subordinates perform, and the efficiency report is one of the tools for doing this. If you use it in too heavy-handed a way, it won't work.

So, it is doubly necessary to focus on strength, rather than weakness, because for a tour of duty you are stuck with your subordinates and your boss. There is very little you can do to change them. Therefore, it is important to look at what a man has done in order to get some notion of what he should be able to do well, and of what he needs to learn in order to maximize his natural and acquired strengths.

The executive who complains that he doesn't have anybody who can do anything is simply a poor executive. That doesn't mean you should regard everybody who works for you as a genius and make them think they are. Not at all. You must be tough and realistic, but you should also know what your people can do and make full use of them.

These are the habits of effectiveness. They are acquired. They are not inborn. I'm not saying that some people are not better than others. But everybody can acquire these habits and use them to advantage. You need these habits because you will not be masters of your time, and because very few of you will get to be Chairman of the Joint Chiefs of Staff. You will have to work within an organization with objectives which were set before you got there. You will have to make that organization perform and work toward those objectives.

No one can say today what the military establishment of the United States will look like 10 years from now. The establishment will still be here; it won't go away. But it may change quite a bit, externally and internally, with new technologies, new missions, and new relationships to the society in which we live.

It is quite clear—although perhaps you don't fully realize it—that we no longer look upon a large military establishment as temporary, as we did until recently. I have known it for a long time, perhaps some of you have known it. But the general public and some of the politicians haven't known it. Everything has had to be justified on an emergency basis. But we have about run out of emergency justifications, and we will have to begin to make permanent policy decisions. Whether we are prepared to make them is the question.

Since change is now pervasive, continuous, and permanent, we can no longer depend on the organization, as your predecessors did, to operate effectively. The military establishment which they built between 1940 and, say, the mid-1960's was and is a remarkable achievement. For a long time, it carried the executives who ran it. Sure they had to be good, but the parameters were set. That day has passed. You will have to carry yourselves. You will have to think through the problems and solve them. The organization won't do it for you.

This is why I say it is important to ask yourselves, "How can I be effective?" My observation—and I have been around a little time—is that this is becoming harder, not easier.

BEHAVING RATIONALLY IN AN IRRATIONAL UNIVERSE

Maybe you have heard the old definition of a sane man. A sane man is not the man who believes that the universe is rational; only a paranoid believes that. A sane man is a man who knows how to behave rationally in an irrational universe. That is all I have been talking about.

I don't think the universe will be altogether irrational but it will be very hard to understand, much less to predict. I believe we are coming to the end of the period that started after World War II, internationally and domestically, in values as well as in structures. So there is a much higher premium on being effective and on getting the right things done. This will be the greatest challenge that your generation of senior officers will face.

TANKS

In the Artillery Role

Tanks employed as artillery? "Never happen!", you say.

On 17 May 1951 the US X Corps employed 32 tank platoons, or about 160 tanks, as additional fire support during the battle of Soyang. LTG Edward M. Almond, the corps commander at the time of the battle, said during a February 1952 conference at Fort Sill, ". . . . To further thicken the field artillery support of infantry units, artillery units instructed key personnel of the organic tank organizations in the methods of indirect fire. These personnel then instructed the crews of their own units in these methods."

Despite this historical record and other accounts of similar instances, current tactical doctrine states that tanks will not be used in the field artillery (indirect fire) role because of the high velocity, small bursting radius, and flat trajectory of tank gun ammunition and the short tube life of tank guns. A research report prepared in 1953 at the Armor School had the following comments pertaining to the disadvantages of employing tanks as artillery: ". . . . Present type weapons wear rapidly, and the utilization of large amounts of ammunition over short periods of time is

inadvisable . . . At ranges up to about 10,000 yards, the trajectory of the tank gun is so flat that indirect fire will be masked by most terrain. . . . Tank guns are incapable of maintaining a high sustained rate of fire . . . . Angles of fall at ranges of 5,000 yards and less are such that the bursting area is limited."

A command decision may be made, as it was in the historic example cited above, to employ tanks as artillery in spite of the disadvantages. When such a decision has been made under exceptional tactical considerations, the tanks will be placed under the operational control of the supporting field artillery. The tank unit may be given a reinforcing mission or it may be attached, but the tank unit must retain the capability of immediately reverting to its primary role of offensive combat. The selection of firing positions for the tank unit must be made with this factor in mind. A good firing position for tanks employed as field artillery must—

- Permit the delivery of fire on targets in the assigned sector.
- Permit the tanks to rapidly revert to their primary role.
- Provide hardstand with level ground.
- Permit 6,400-mil traverse.
- Allow proper dispersion of tanks.

Tanks must move into position rapidly and smoothly. The platoon leader's tank moves in on the right and each succeeding tank takes a position to the left of, but not in a straight line with, the other tanks. The staggered positions provide fire coverage in depth, permit firing to the flanks, and provide passive defense against enemy fire.

ARMOR'S OFFENSIVE SPIRIT

The commander who decides to employ tanks in the field artillery role must be aware of a disadvantage more serious than the unfavorable ballistic characteristics of tank guns and ammunition. This is the loss of armor's offensive spirit. An armor officer at the I Corps Headquarters in 1950 commented, ". . . Back in mid-September it was common practice to employ all tanks in a supporting artillery role. In the initial stages of the Taegu perimeter breakout, it became evident very early that high ranking commanders were not prepared to make full use of the tanks at their command, either for the breakout or for the exploitation. Operations were becoming stalled and it took an emphatic personal letter from the corps commander to break loose the armor . . . ."

Armor soldiers are not normally trained to employ their tanks as field artillery pieces for the reasons stated. As MG Ernest N. Harmon said in 1943 "Tankers must be imbued with the idea of fighting with direct fire . . . . The tanker holds as his sacred trust the traditions of cavalry and the spirit of the offense. Each soldier has a place; a job he knows best. It is at this job and in this place that he should be called upon to accomplish his mission in battle. The place for the tanker is not providing fire support, but providing shock effect."

The Next Step in . . .

Automatic Data Processing

MAJ James I. Warner
U. S. Army Combat Developments Command Field Artillery Agency

The field artillery gained its first experience in the application of automatic data processing to command and control functions in 1959 with the development of the computer, gun direction, M18, (FADAC). The benefits FADAC brought to fire direction included faster, more accurate solutions due to the reduction of human errors and the elimination of approximation errors introduced from charts, GFTs and TFTs. Initially, FADAC was not universally accepted because of—

- a reluctance to accept computerized solutions to problems as critical as fire direction;
- ancillary equipment problems, notably generators;
- and the need to back up the computer with manual procedures.

In time, however, the usefulness of FADAC became known, and additional programs were prepared to handle applications in Honest John and Lance gunnery, the visual airborne target locating system (VATLS), survey, meteorological data reduction, and sound ranging as well as other applications outside the field artillery.

TACFIRE

The second step for field artillery ADP is now underway with the development of the tactical fire direction system (TACFIRE). The feasibility of applying ADP to field artillery technical fire control was initially proved by the FADAC system. As a result, extensive studies were conducted during the period 1961 to 1965, to determine where improvements to command and control could be achieved through automation of additional functions. These studies culminated in a qualitative materiel requirement (QMR), which primarily concerned hardware requirements, and a functional system requirement (FDSR) on a software for the TACFIRE.

Within the cannon battalion, TACFIRE will include a shelter-mounted computer center on a 2½-ton truck. This center will serve as the battalion fire direction center. Battery display units (output-only devices used primarily for fire commands) will be located at the firing battery, and fixed-format message entry devices (input-only devices used primarily for fire missions) will be located with each forward observer. Computerized functions to be accomplished within the battalion are ammunition and fire unit status, technical and tactical fire control, nonnuclear fire planning survey, meteorological data distribution, and the forwarding of artillery target intelligence to division artillery.

At the division artillery level, TACFIRE equipment will include a computer center mounted in two shelters on 2½-ton trucks at the fire direction center. Variable format message entry devices (input and output devices) will be situated at remote locations in the fire support

element (FSE) and also with missile or rocket battalions. Automated functions provided for the division artillery fire direction center will be the same as for the battalion with the addition of artillery target intelligence processing and the deletion of technical fire control processing. Functions to be performed by the division artillery computer for the FSE include nuclear and chemical target analysis which is the selection of the best type weapon system to attack a target. The missile and rocket battalions receive support from division artillery computers excluding ballistic computations.

The preceding description of hardware and software encompasses initial contract purchases to provide austere first-generation TACFIRE equipment for division artillery headquarters and all cannon battalions. Future expansion of TACFIRE is expected to include computer centers at corps and group level, input-output devices for liaison officers, and survey and target acquisition systems. TACFIRE will enter the engineer test and service test phases early next year. Fielding of the first system is expected in 1973.

WHY TAKE THE NEXT STEP?

Since TACFIRE will not be fielded until 1973, it is appropriate to question why additional ADP is being projected for the field artillery at this time. Four basic reasons are:

First, the nature of the enemy threat confronting military planners is characterized by increased sophistication. Typically, this sophistication encompasses the areas of mobility and firepower, command and control, and extension of integrated surveillance. To meet this threat, our technological resources are being applied in numerous forms. The field artillery seeks more responsive artillery fires through the use of ADP to improve technical fire control capabilities, to facilitate command and control, and to integrate target acquisition systems.

Second, the next step in ADP is needed to provide for decentralized or separate battery operations. As we pointed out, the TACFIRE computer is located at the battalion level. A battery separated from its parent battalion would have to satellite on another battalion possessing an ADP capability or revert to manual operations. Another means being considered to support decentralized operations is the retention of FADAC at field artillery cannon batteries.

Third, FADAC provides support for field artillery applications which are not included in TACFIRE. From an operational point of view, priority applications using FADAC are found in separate cannon batteries, Honest John and Lance units. Following these are meteorological data processing, VATLS data processing, and the sound ranging applications. Survey in the field artillery target acquisition battalion (FATAB) is not served by TACFIRE. The preceding applications have continuing requirements for ADP support in their current form or as part of successor systems that will continue well into the future.

Fourth, the present FADAC design is more than 10 years old. The age of FADAC impacts on the preceding discussion since we are faced

with retaining FADAC indefinitely or replacing it in order to maintain desired levels of automation in field artillery operations. Arguments for replacing FADAC are related to application of state of the art technology to achieve reduction in size and weight, use of a universal power source, improved capabilities, and the prospects of achieving modular equipment tailored to specific needs.

MINIBAC, THE NEXT STEP?

A proposal to meet the preceding requirements is a miniaturized battery computer (MINIBAC). The following paragraphs outline the MINIBAC hardware and field artillery applications of the computer. The MINIBAC concept is still in the process of being formulated (fig 1).

The basic MINIBAC is envisioned as a miniaturized computer self-contained in a case less than half the size of FADAC (1 foot by 1 foot by 2 feet, or smaller) and weighing 50 pounds or less. Components of the basic MINIBAC would include—

- The computer, 20 times as fast and with twice the memory capacity of FADAC.
- A cathode ray tube (CRT) type device and a keyboard similar to TACFIRE.
- A small matrix for the selection of input formats.
- A printer.
- Built-in test circuitry.
- Battery or fuel cell power with an option for using external power.

Optional configurations with the basic MINIBAC would be to exclude the printer and/or to operate with less memory. The rationale for including the CRT type device is to permit message composition by filling in the blanks of a skeleton format, such as in a fire mission, and to reduce retraining for operators exposed to both TACFIRE and MINIBAC

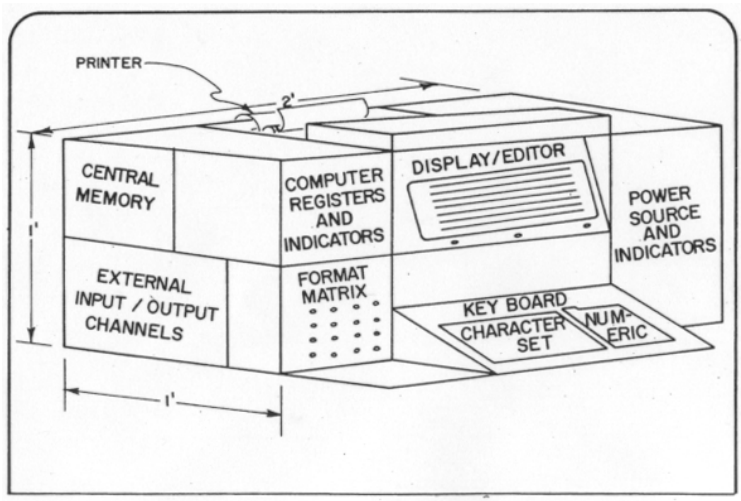


Figure 1. MINIBAC

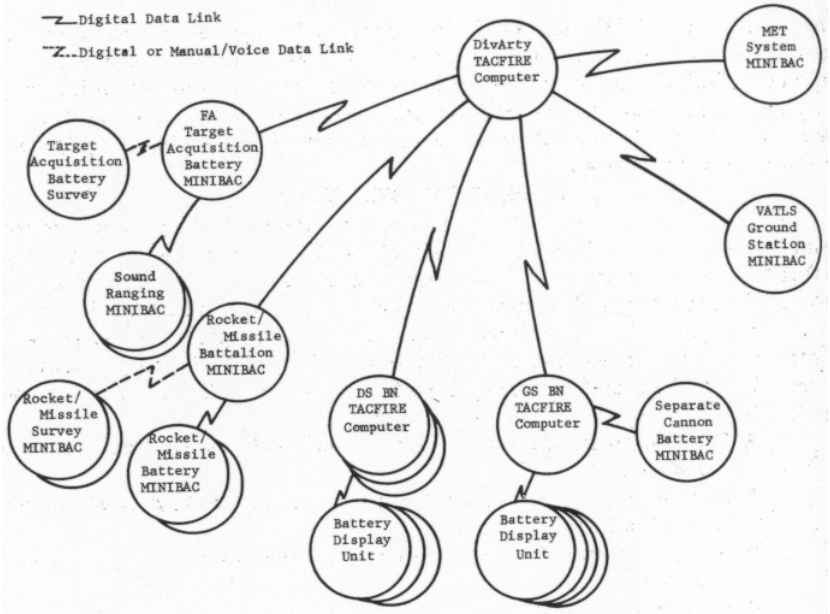


Figure 2. MINIBAC/TACFIRE configuration.

by standardizing the man-machine interfaces. The estimated cost of the basic MINIBAC described above compares favorably with the cost of FADAC and its associated equipment. The applications for MINIBAC in the basic configuration would be essentially those described above that are not being included in TACFIRE.

Ancillary equipment developed with the MINIBAC would include remote interface equipment and auxiliary storage modules. The purpose of the remote interface equipment is to provide the capability for remote operation with remote devices, such as the fixed-format message entry device with the forward observer, and/or with other computers. The computer-to-computer interface will permit transmission of digital data to the TACFIRE system without the need for intermediate manual reformating and conversions as is presently required for the meteorological, VATLS, sound ranging, and missile and rocket applications. The auxiliary storage provides an expanded storage capacity for other applications, such as missile and rocket battalion fire direction centers or the FATAB. Figure 2 shows the concept of a division artillery with MINIBAC being used to integrate key field artillery systems with TACFIRE.

WHEN TO TAKE THE NEXT STEP?

With the what, where, and why covered, the when is needed to complete the picture. Liaison with industry indicates that the technology is available for taking the next step in field artillery ADP. Requirements

definition, the first milestone in the development cycle, is nearing completion. The immediate goal is to field MINIBAC by mid-1974 to automate applications toward the artilleryman's goal of ranging over the battlefield with timely and accurate fires. The potential future of MINIBAC points toward a key role in the overall integration of all field artillery systems—the king of battle under the integrated battlefield control system of tomorrow.

———————— ● ————————

STOCKLESS RIFLE

Field artillerymen got their first look at a new concept in personal weapons when a prototype model of the "stockless rifle" was demonstrated recently at Fort Sill. The weapon evolved from work on a compact, light-weight aircrew survival weapon done by the Air Force Armament Laboratory. In order to reduce bulk and weight to the minimum, the weapon has no stock—instead, the shooter's arm and shoulder act as the stock. The pistol grip and trigger are attached near the muzzle and can pivot around the barrel. The quite flat action, as well as the magazine, is located to the rear. In firing, it rests across the right forearm and is held lightly in place by the left hand. This results in a weapon more stable and, thus, more accurate than the pistol, yet without the size and weight of a rifle. The stockless rifle can reliably hit and kill a man at 100 yards and has an easily controllable full-auto capability; but it weighs only 2.5 pounds, is 15 inches long, and 1 inch thick.

The test model fired at Fort Sill was in .221 Remington caliber, but two other models are being built by Colt. The smaller is the aircraft survival weapon in .17 caliber; the other is a larger rifle/submachine gun in 5.56-mm caliber. If the stockless rifle is adopted for wider use, its main application would be as a personal arm for personnel working in close quarters or otherwise burdened—aircrews, tankers, airborne troops, field artillerymen. Artillerymen who must both work with their cannons and defend their battery areas will appreciate its small size and weight—it is nearly as convenient as a pistol. Yet it offers most of the capabilities of the M-16 rifle—accuracy at longer ranges, great firepower, quick repeat shots, and full-auto fire.

Airmobile Infantry Battalion

Communications

Communications Electronic Trends, *a journal of the U. S. Army Signal Center and School at Fort Monmouth, New Jersey, recently published the results of a roundup report on communications by an airmobile infantry battalion in Southeast Asia. The communications standing operating procedures of an airmobile infantry battalion are of interest to the field artilleryman. These 11 paragraphs tell how it's done in the airmobile infantry battalion.*

1. All equipment authorized the communications platoon is transportable by helicopter or CV-2 fixed-wing aircraft.

2. Radio is the primary means of communication. Wire is used only for local command post (CP) communications. The SB-22 switchboard has proved adequate in all combat operations. In some instances the battalion was required to establish its own semifixed base communications until a signal unit was made available. Telephone communication with supply facilities, companies, battalion staff sections, and higher headquarters was required "in garrison", therefore, additional field telephones and switchboards were requisitioned for this purpose, thus insuring that the TOE equipment would be always ready for combat operations.

3. The primary job of the communication platoon is to install three brigade net and three battalion net terminals. The battalion nets, which link the companies, consist of one FM command net, one FM administrative/logistical net, and SSB command/logistical net. The brigade nets consist of one FM command net, one FM operations net, and one SSB administrative/logistical net. The communication platoon also operates an AN/VRC-24 for ground-to-air communications. Portable PRC-25 and PRC-47 radios are on hand as auxiliary sets for use during the initial phases of airmobile operations.

RC-292 ANTENNAS

4. In many instances, because of terrain and undergrowth, the battalion forward CP operated as long as 7 days with only the portable FM and SSB radios. During these periods, airborne FM relay was used to extend the transmissions of the PRC-25 to both higher and lower headquarters. RC-292 antennas were used extensively with portable FM radios. Forward air controllers and artillery observers working with the battalion were also equipped with portable FM equipment. On many occasions, airborne relay was provided by CV-2 aircraft, which often had six relays operating at the same time. The multiple relay was used during many combat operations for simultaneous support of the brigade command, artillery fire control, forward air control, and medical

evacuation nets. The battalion received outstanding logistical and medical evacuation support which it would not have received without the airborne relay.

5. When operating from helicopters, unit commanders almost always keep their communications officers or senior communications sergeants with them. They carry PRC-25 radios with RC-292 antennas in the aircraft and are thus able to establish FM communication quickly when their helicopter posts are on the ground.

COMMUNICATION JEEPS

6. Four radios are mounted in each of the two communication jeeps, and an AN/MRC-95 (SSB terminal in the brigade admin/log net) and three FM radios (brigade command, brigade operations, and battalion command nets) are mounted in one ¼-ton vehicle. Antennas are located one at each corner, and interference among them is nonexistent. A jeep communication package includes at least one MRC-95 (SSB), one VRC-24 (UHF), and one VRC-46 (FM).

a. Similar radio packages have been made up for service aboard a "Mule," and these too have proved successful during combat operations, though they require separate power supplies. Unlike the ¼-ton truck, the Mule cannot supply its own power needs and those of the radio sets too. But this disadvantage is offset by the fact that the Mule itself, along with its cargo of radio equipment and generator, can be picked up and transported as a sling load by a UH-1 helicopter. The high altitude at which many operations were conducted, prohibited such lifting of a fully loaded ¼-ton vehicle.

b. The Mule package consists of one 3-kw DC generator (new Army standard), two VRC-46's (each with an RC-292 antenna), one PRC-47, and one 28-volt vehicular battery. All equipment was affixed to a platform that was readily mounted on the bed of the Mule. The PRC-47 and the VRC-46's are operated off the 28-volt battery, which is charged by the generator. One lesson was brought home repeatedly: direct operation off the generator causes serious damage to the radios because of the power surges from the generator.

AIRBORNE COMMAND POSTS

7. Airborne command posts have been used extensively. The ARC-122, authorized by TOE, was easily installed in the UH-1B helicopter without modification of the aircraft. This radio enables the commander to operate in the brigade and battalion FM command nets without using the radios required by the pilot. It also provides intercommunication within the aircraft. The radio used in the command package is the VRC-46, which was chosen in preference to the ARC-44 or the ARC-54 for three reasons:

a. It is fully compatible with the radios on the ground (VRC-12 series and PRC-25). Its entire frequency range (from 30.00 to 75.95 MH_3, with 50 KH_3 channel spacing) can be used, whereas the ARC-44's range (24 to 51.9 MH_3 with 100 KH_3 channel spacing) and that of the ARC-54 (30 to 69.96 MH_3 with 50 KH_3 channel spacing) are more limited.

b. The VRC-46, with its 35-watt average power output, has a reach of up to 150 miles from a helicopter flying at altitudes of 3,000 to 6,000 feet. The power output of the ARC-44 is 8 watts and that of the ARC-54 averages 10 watts.

c. Rapid replacement of inoperative VRC-46's is possible at all echelons above company, to include forward supply points, whereas ARC-44 and ARC-54 replacements have been available only at avioncs maintenance shops, which are seldom near at hand.

RADIOS RECHECKED

8. Maintenance required by the VRC-12 and PRC-25 is a great deal less than that required by the older GRC-3 through -8 series.

9. After each major operation the VRC-12's are rechecked by third echelon repairmen and peaked, if necessary for the next operation.

10. VRC-12 vehicular antennas at first presented a safety hazard. To prevent the antennas being damaged by overhanging branches, vehicle operators made a practice of tying them down to hooks on the sides of the windshields, thus causing them to lie along the sides of their vehicles, their sharp tips projecting forward and head-high. On one occasion an officer, running in the dark, was fatally injured by a protruding antenna. Thereafter, wooden or plastic blocks were placed over the antenna tips and, when required, the antennas were tied down to the center windshield straps.

11. Cryptographic equipment is not carried, since battalion headquarters is often airlifted deep into enemy territory. In most cases classified traffic to the battalion is handled by the commander during visits to higher and lower headquarters or by liaison officers or special messengers. There is, however, urgent need for a lightweight voice encrypting device that can be used with a portable radio. Such a device would have to be unclassified and should be part of the radio. It would eliminate the present requirement for the reams of paper used for operation codes, call signs, authentication codes, and map-coordinate codes.

MUZZLE VELOCITY CALIBRATION

Two ordnance units are now available in CONUS to assist field artillery commanders in determining the muzzle velocities of their weapons. Calibration by the skyscreen chronograph method not only insures maximum accuracy in fire support, but also meets the requirement in FM 6-40, paragraph 22-3 for annual calibration. Actual time for the calibration of a battalion is generally four to six daylight hours and requires 10 rounds of ammunition per tube for the comparative calibration. The 151st Ordnance Detachment has area responsibility for CONUS units west of the Mississippi, with requests for their services monitored by Fourth US Army, ATTN: AKADD-DK. Units east of the Mississippi may request calibration services from the 180th Ordnance Detachment, Fort Bragg, with requests monitored by Third US Army, ATTN: AJAGL-D-M-C.

Revised Program For FADAC

During the past 2 years, Frankford Arsenal has developed an improved cannon program for the M18 gun direction computer (FADAC). This program will be identified as revision 4. The tapes were distributed worldwide in December 1970.

The new revision 4 program incorporates the following improvements—

- A 21 percent faster ballistic solution.
- Zone-to-zone UTM coordinate transformation.
- Expanded storage for 118 targets and 39 no-fire areas.
- Added capability for the M485 155-mm illuminating shell and the M629 105-mm CS round.
- Elimination of 20/R in high-angle, VT fuze missions.
- An improved program test 1; the new routine ends in 11 seconds.
- An improved chronograph data reduction routine which will use any delay gate setting.
- Range K application as a variable for increased accuracy in transfer of fire.
- Elimination of the auxiliary charge input capability.

The new program uses a different matrix design (fig 1). The most significant changes in the new matrix are the added zone-to-zone transformation functions in locations E-5 through E-8 and the elimination of separate recall matrix positions for targets, observers, no-fire areas, and temporary mission data. In each case, the new program uses each **STORE** function and the RECALL key in lieu of the former separate recall functions.

The USAFAS began teaching the new procedures in the latter part of 1970. With the exception of the added zone-to-zone transformation routine, most procedures are identical to the current procedures, and operators who are familiar with the current program can be trained to use the new program in a few hours. Here is some information on the major change, zone-to-zone transformation procedures—

- Matrix location E-5 is used to enter the hemisphere flag (+ for the Northern Hemisphere and — for the Southern Hemisphere) and the UTM grid zone numbers of the local zone as well as the adjacent zone.
- Matrix locations E-6 and E-7 are used to enter the coordinates of the point to be transformed—six digits for easting and seven digits for northing. (The added digits are the numerical identification of the 100,000-meter square.)

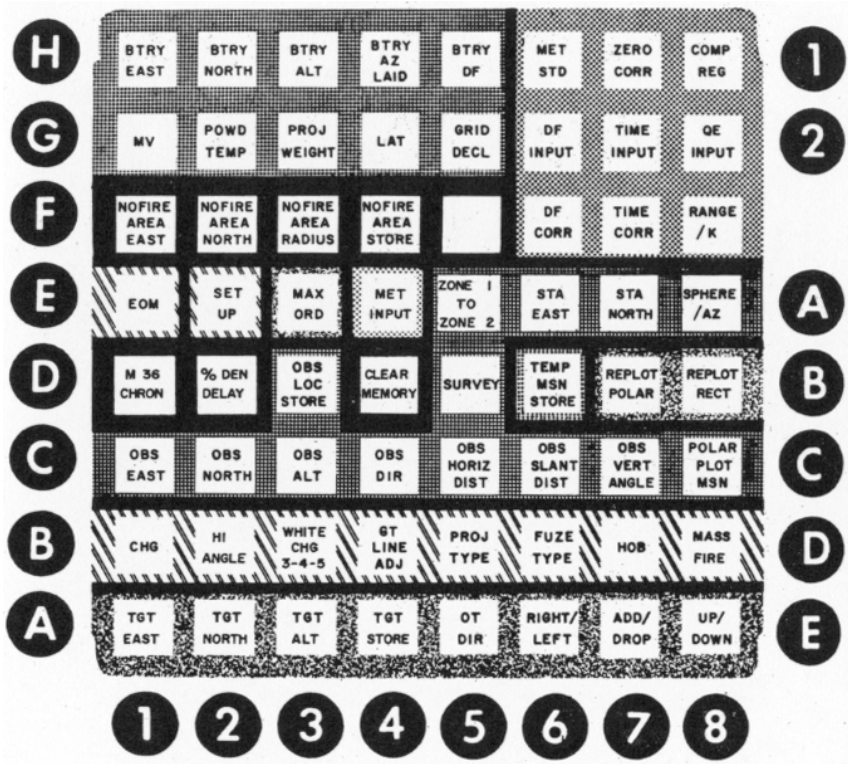


Figure 1. Input selection matrix.

- Matrix location E-8 is used to enter a spheroid flag (any one of the standard five spheroids may be used). An azimuth may also be entered if one is to be transformed.
- Matrix location D-5 is then used to enter the zone-to-zone flag (4) and a flag 1 or 2, depending on whether the point is to be used as a target or an observer. The transformed coordinates will be computed and displayed in about 6 seconds. They may then be stored as either a target or an observer, depending upon the flag (1 or 2) previously entered in D-5.

Like the current program, the revision 4 program tapes will permit any combination of two weapons to be used; however, a different tape configuration is being produced. There will be a basic program tape and 15 addendums. The basic tape contains data for the M102 (or M108) 105-mm howitzer/M109 155-mm howitzer combination. After the basic tape has been loaded by means of the signal data reproducer, a change in weapon combination can be made simply by loading the appropriate addendum. The addendum combinations are as follows:

Combination number	Description
1	105-mm how (M101A1)/105-mm how (M108)
2	105-mm how (M101A1)/155-mm how (M114A1)
3	105-mm how (M101A1)/155-mm how (M109)
4	105-mm how (M108)/155-mm how (M114A1)
5	105-mm how (M108)/155-mm how (M109)
6	155-mm how (M109)/155-mm how (M114A1)
7	8-inch how (M110)/155-mm how (M114A1)
8	175-mm gun (M107)/155-mm how (M114A1)
9	155-mm how (M109)/8-inch how (M110)
10	155-mm how (M109)/175-mm gun (M107)
11	8-inch how (M110)/175-mm gun (M107)
12	105-mm how (M101A1)/8-inch how (M110)
13	105-mm how (M108)/8-inch how (M110)
14	105-mm how (M101A1)/175-mm gun (M107)
15	105-mm how (M108)/175-mm gun (M107)

The revision 4 tape kit, FSN 1290-466-0140, was shipped directly from Frankford Arsenal to artillery battalions in December 1970. The kit will contain 2 copies of the basic tape (a spare is included), FSN 1290-466-0141; 15 addendum tapes and a clear hot storage tape, FSN 1220-150-9029; 2 diagnostic tapes, FSN 1220-150-9023; 5 plastic matrix panels, FSN 1220-150-9022; 5 flag cards, FSN 1220-466-0139; and 5 copies of FM 6-40-3 (Oct 70).

Use of the revision 4 program, however, will depend on the implementation of an international standardization agreement on reporting computer meteorological data. The official document stating the terms of the agreement is known as STANAG 4082. Fourteen nations under NATO, including the United States, are signatories to this agreement. The date of implementation will be early in 1971.

The revision 4 program is designed to use the STANAG 4082 meteorological message, which will report **air pressure** rather than **air density** at each atmospheric level. The program will produce erroneous data if the current **air-density** met is used. Caution in using the proper met message is extremely important. The STANAG 4082 met may be readily identified by comparing the last three digits in the 00 line with the last three digits in the ID line (fig 2). If they are identical, the message is reporting **air pressure** in millibars.

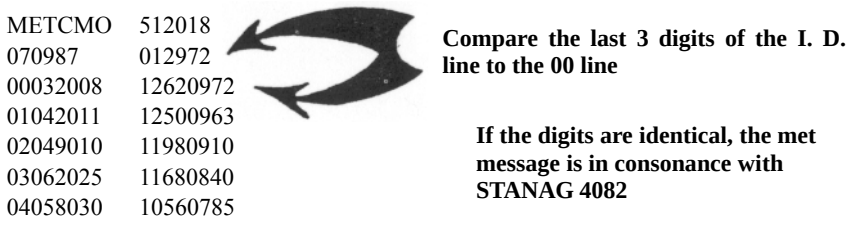


Figure 2. STANAG 4082 Met Message.

Since the current Honest John program uses **air density,** an addendum tape which will modify the program to accept and use the STANAG 4082 met will be issued to all Honest John battalions. This addendum tape and instructions on its use will be issued in 1971 directly from Frankford Arsenal to each Honest John battalion.

This new FADAC cannon program will improve the artillery's ability to deliver effective fire.

NEW HANDBOOK

In January 1971 the US Army Field Artillery School published a new booklet, the **Fire Support Officer's Handbook.** This 82-page handbook is similar in format to the familiar handbooks for the battery executive officer and the field artillery forward observer. The convenient pocket size of these handbooks makes them easy to carry and use in the field.

The purpose of the **Fire Support Officer's Handbook** is "to provide a ready reference for the field artillery fire support officer (formerly the field artillery liaison officer), who functions as a fire support coordinator (FSCOORD) for a maneuver brigade or battalion." Since the Fire Support Officer (FSO) at battalion level is the full time FSCOORD and is the FSCOORD at brigade level in the absence of the field artillery battalion commander, he must be familiar with all fire support systems and the correct procedures for their use. This booklet will aid him in performing these duties.

The **Fire Support Officer's Handbook** is unclassified, reflects the current thought of the Field Artillery School, and conforms with Department of the Army doctrine. The first chapter deals with the duties of the FSO and with his organization and equipment. Included in this chapter is a glossary of terms and a discussion of both the liaison and coordination functions of the FSO. The succeeding chapters treat each fire support system in detail: Field Artillery, Close Air Support, Naval Gunfire, Attack Helicopters, and Mortars. Each chapter includes a complete list of references to applicable field manuals. The type of information found in the Field Artillery chapter is similar to that in the other chapters: a general introduction followed by sections on fire planning channels, fundamentals of employment, characteristics and capabilities of the weapons, sheafs/fronts for the weapons, the field artillery fire support team, and communications. Throughout the text are tables covering fire planning channels, weapon characteristics, performance data, types of missions, organization for fire support, as well as illustrations of helicopter armament systems, naval fire support ships, and tactical aircraft. The three final chapters deal with special ammunition (nuclear and chemical) and smoke, fire support planning (principles and coordination measures), and lessons learned in Southeast Asia. There is an index in the back for quick reference.

The **Fire Support Officer's Handbook** will be revised periodically to insure accuracy and to reflect the most recent School and Army doctrine. It should prove to be a valuable aid for any officer whose duties involve fire support.

Royal British Artillery

LTC Glenn K. Skulborstad
Gunnery Department
USAFAS

From the rolling plains of Larkhill, the home of the British School of Artillery, to the battlefields of the world, the Queen's Gunners have impressed friend and foe with their professionalism.

The basic British unit for operations in the field is the battle group—an infantry or armored battalion augmented by elements of other arms. Two to four battle groups form a brigade, two or three brigades form a division, and two or three divisions form a corps. For tactical planning, the basic organization is the brigade. There are three types of brigades—infantry, armored, and parachute. The brigade commander has tremendous flexibility in organizing the separate units to fit his requirements. The standard configuration of the brigade is shown in figure 1.

	TYPE OF BRIGADE					
UNIT	**INFANTRY**		**ARMORED**		**PARACHUTE**	
INFANTRY	3	Battalions	1	Battalion	3	Battalions
					1	Independent Plat
ARMOR	1	Regiment	3	Regiments	1	Para Squadron RAC
ARTILLERY	1	Field Regiment	1	Med Regiment	1	Lt Regiment (PARA)

Note 1: Independent platoon is responsible for—
1. Reconnaissance
2. Marking of drop zones

Note 2: Parachute squadron includes a Royal Armoured Corps Ferret scout vehicle with Swing Fire missiles.

Note: Svy Sect—strategic reserve units only
B Ech—rations, ammunition, and supply
LAD REME—Royal Electrical and mechanical Engineers
LOC Tp—Artillery intelligence section and radar section with 2 radars

Figure 1. Standard configuration of the brigade.

In the BAOR (British Army of the Rhine), the brigades are organized under the square brigade concept; for example—

- 2 infantry battalions (mech)
- 2 armored regiments
- 1 field regiment Royal Artillery
- 1 medium battery Royal Artillery

The types of artillery regiments—field, medium, and light—shown in figure 2 and in BAOR are essentially the same except for varying armament.

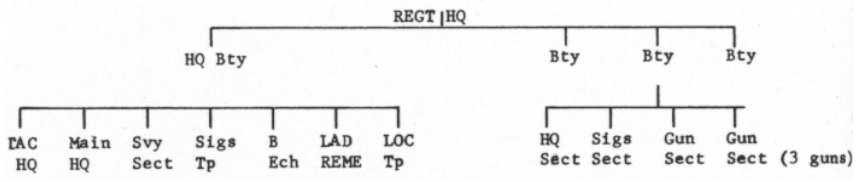


Figure 2. Organization of artillery regiments.

CLOSE SUPPORT REGIMENTS

Close support regiments are included in orders of battle on a scale of one per brigade. Equipment varies according to the role of the formation or unit being supported.

In the BAOR, regiments are equipped with the 105-mm (self-propelled) gun (ABBOT) (fig 3).

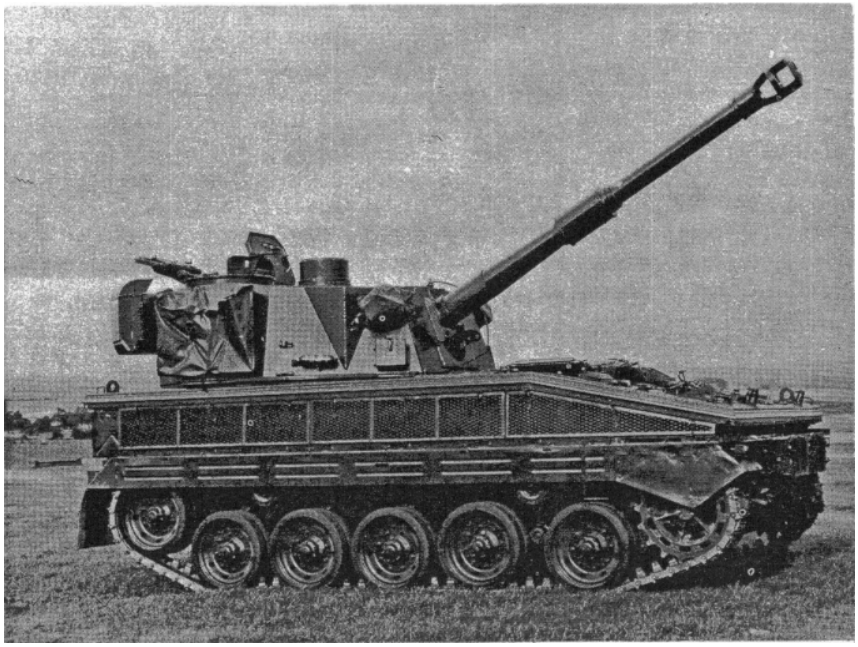


Figure 3. Abbot.

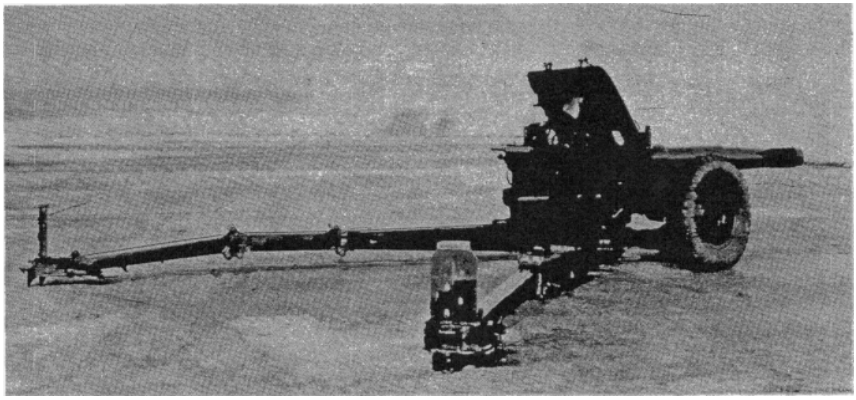


Figure 4. 105-mm L5 pack howitzer.

In the Strategic Reserve and other overseas theaters, regiments are equipped with the 105-mm L5 pack howitzer (fig 4). This weapon is to be replaced soon by the 105-mm light gun (fig 5).

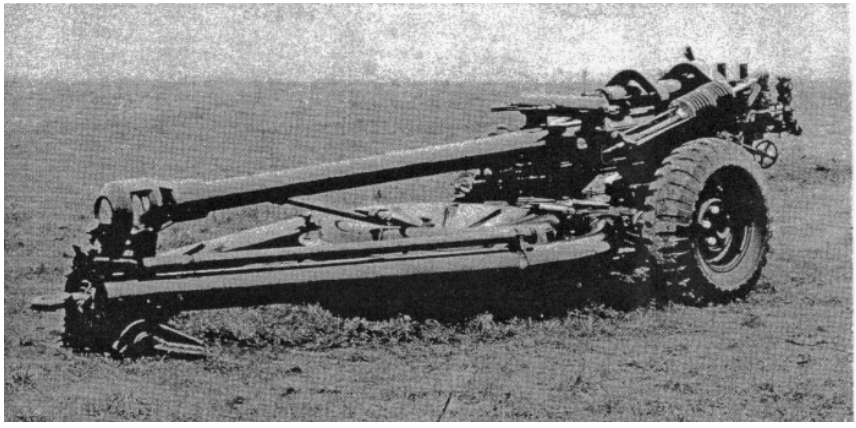


Figure 5. 105-mm light gun (towing position).

GENERAL SUPPORT REGIMENTS

Missile regiments (fig 6) are equipped with two nuclear-capable delivery systems, the 8-inch howitzer and the Honest John free-flight rocket. These regiments are organized on a scale of one per division.

Other general support regiments are equipped with the M107 howitzer (heavy regt (fig 7), the M109 howitzer (medium regt), and the 5.5-inch gun (fig 8). The 5.5-inch gun is to be replaced soon by the FH 70 155-mm gun (fig 9).

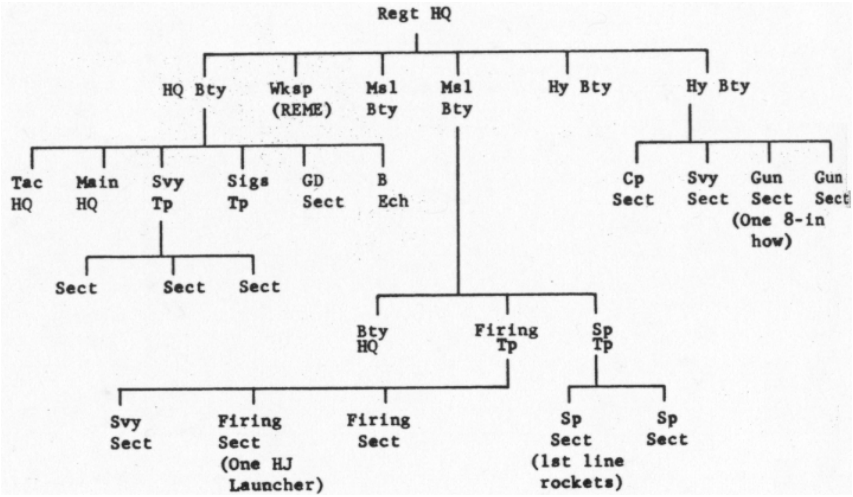


Figure 6. Missile regiments (HJ/8-inch).

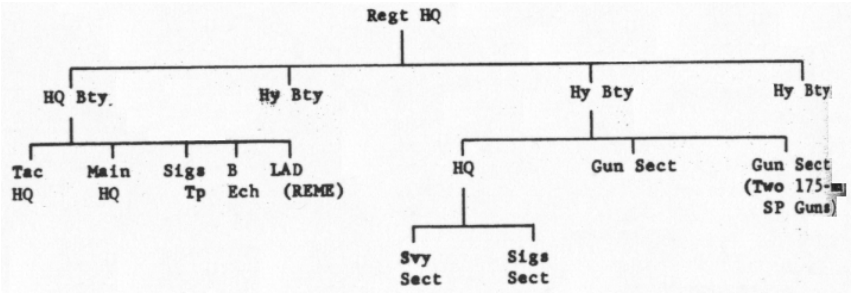


Figure 7. Heavy regiment (175-mm SP).

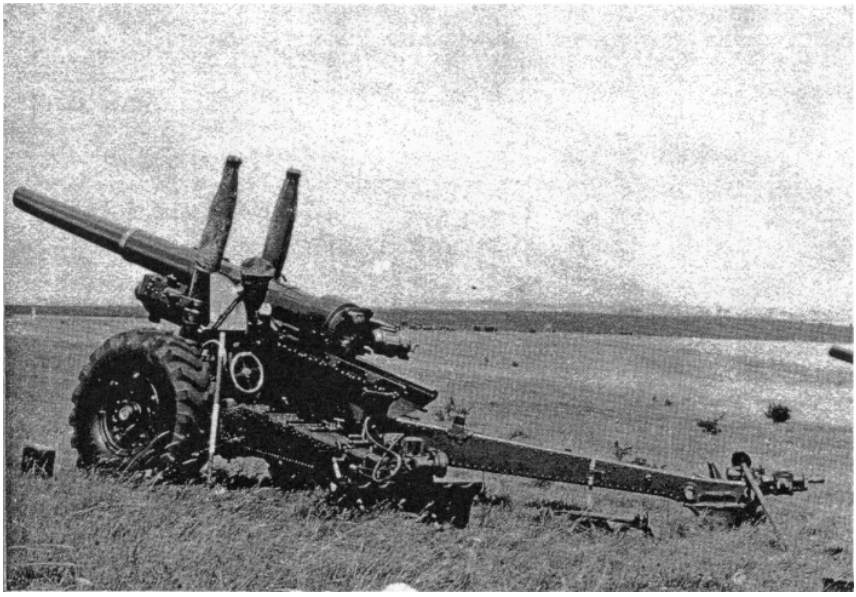


Figure 8. 5.5-inch gun.

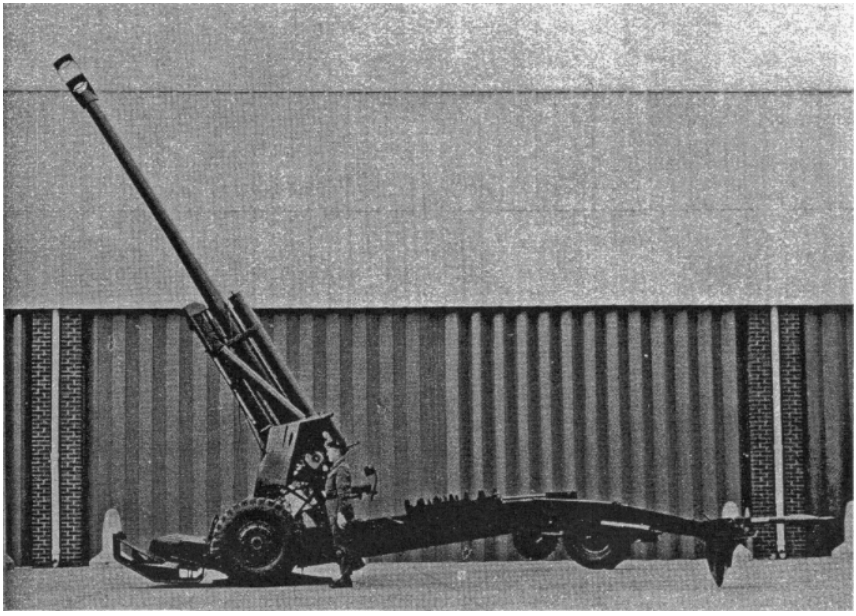


Figure 9. FH 70 155-mm Gun (mockup).

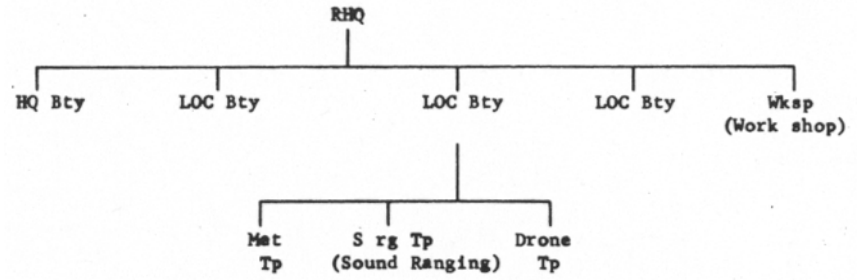


Figure 10. Organization of locating regiment.

Locating artillery consists of a number of subunits with specific tasks. Those subunits either are in locating batteries or form part of artillery headquarters or other artillery regiments. The locating batteries of the locating regiment are composite batteries (fig 10) consisting of drone troops, sound ranging troops, and meteorological troops. Most close support regiments have a locating troop consisting of a radar section with two mortar-locating radars (Mark 1 Green Archer (fig 11), soon to be replaced by Cymbeline (fig 12) and the brigade artillery intelligence

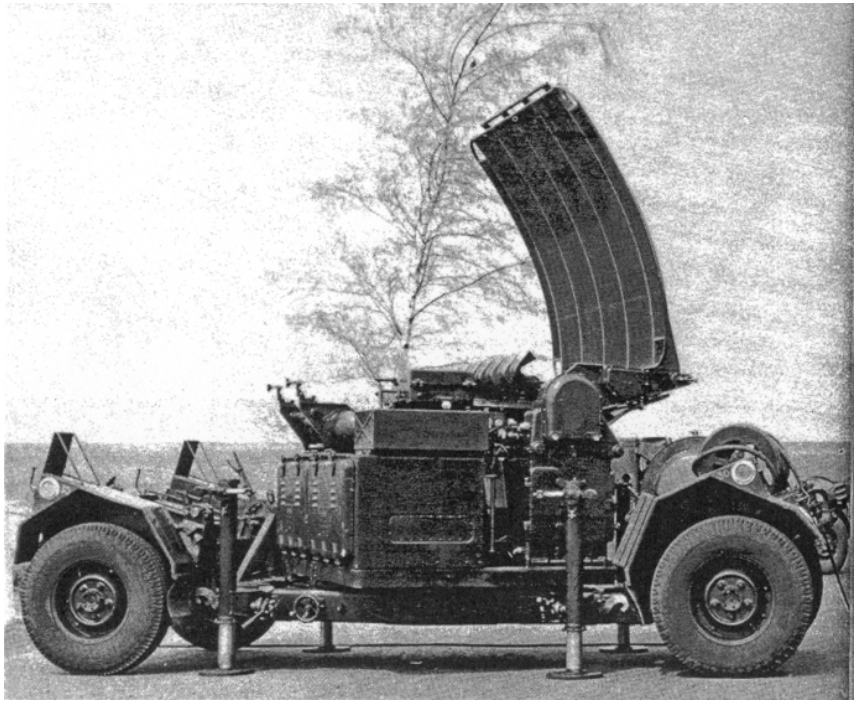


Figure 11. Green Archer

section. The divisional missile regiments have a survey troop responsible for providing artillery survey within the division; however, the allocation of survey resources is kept flexible to allow for any grouping. Divisional and corps artillery intelligence sections are an integral part of their respective headquarters.

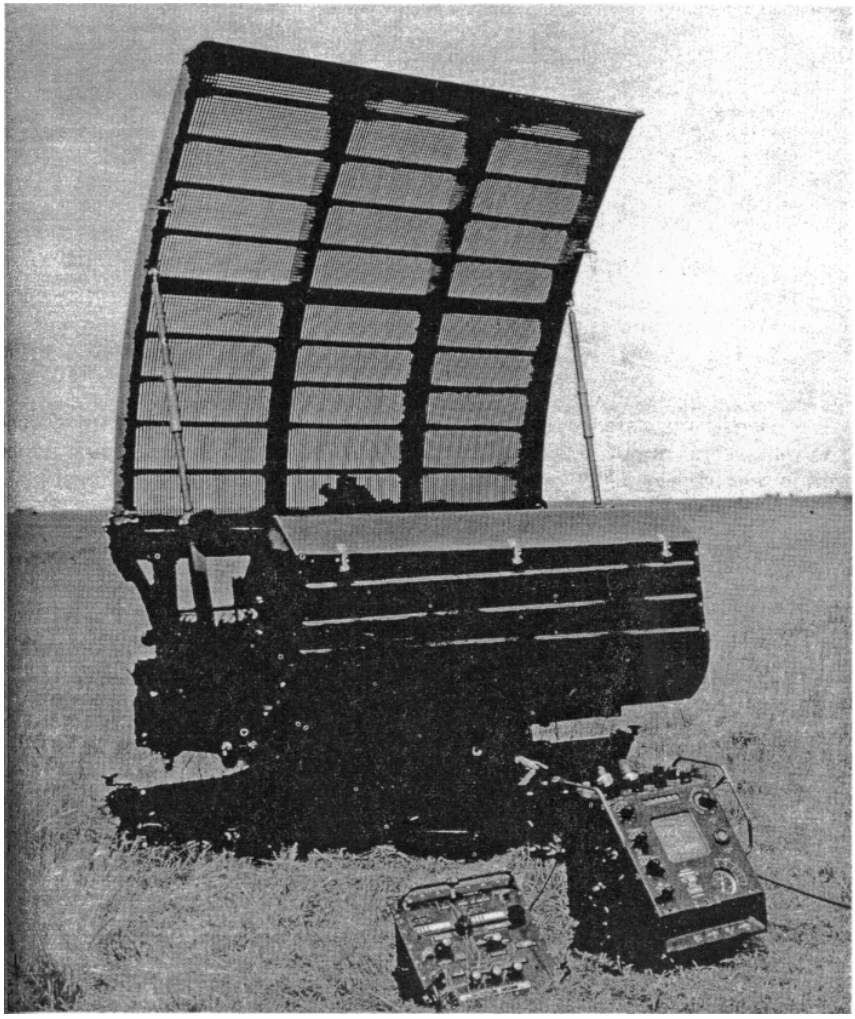


Figure 12. Cymbeline.

Air defence artillery units are classified according to the height at which they engage targets. Light air defence units (fig 13) are those units designed to engage targets at low altitudes, primarily up to 7,000

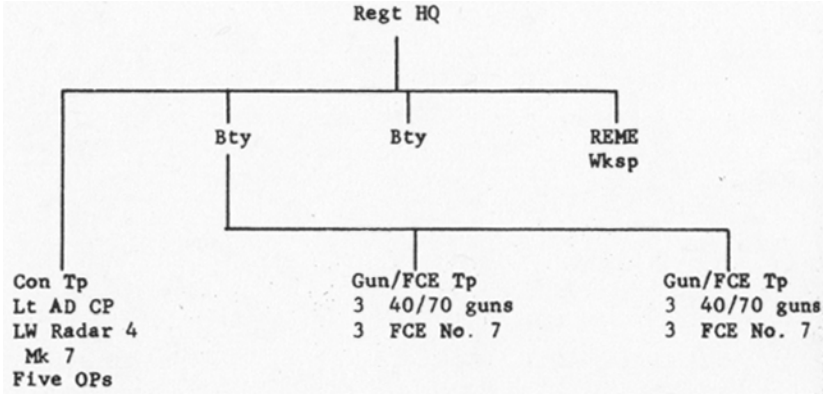


Figure 13. Light air defence regiment (40/70/FCE 7).

feet. The current equipment is the 40/70 fire control equipment 7 (40/70/FCE 7) (fig 14), which is soon to be replaced by the Rapier (fig 15).

Heavy air defence units (fig 16) are those units designed to engage targets from about 5,000 feet upwards. The current equipment is the Thunderbird (fig 17).

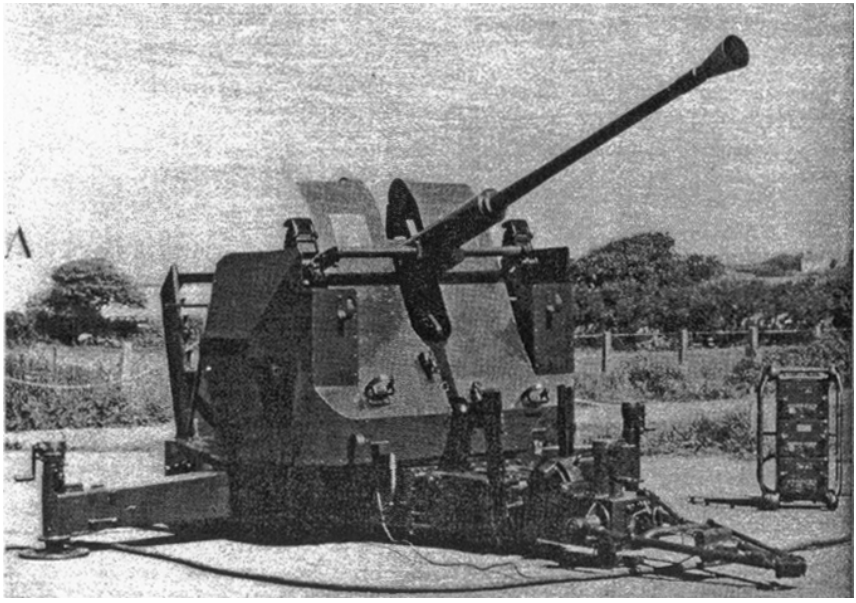


Figure 14. 40/70 fire control equipment 7.

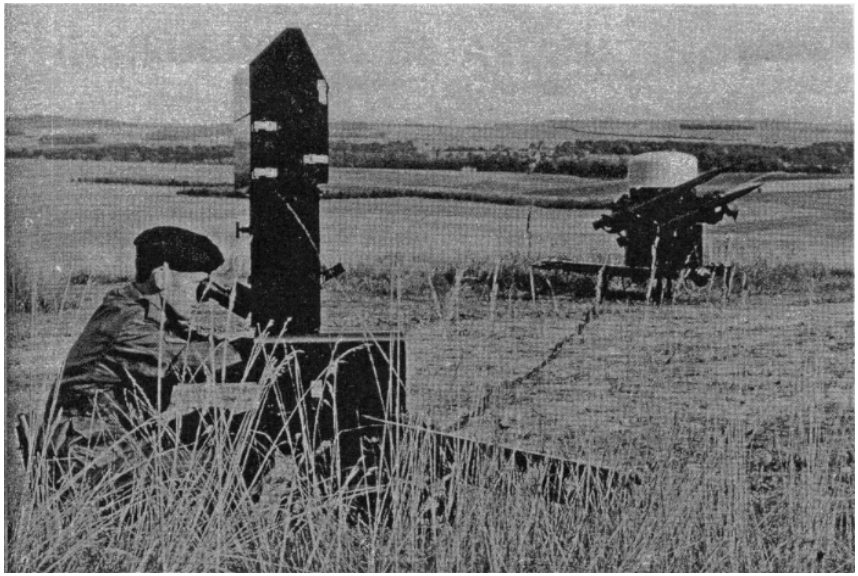


Figure 15. Rapier.

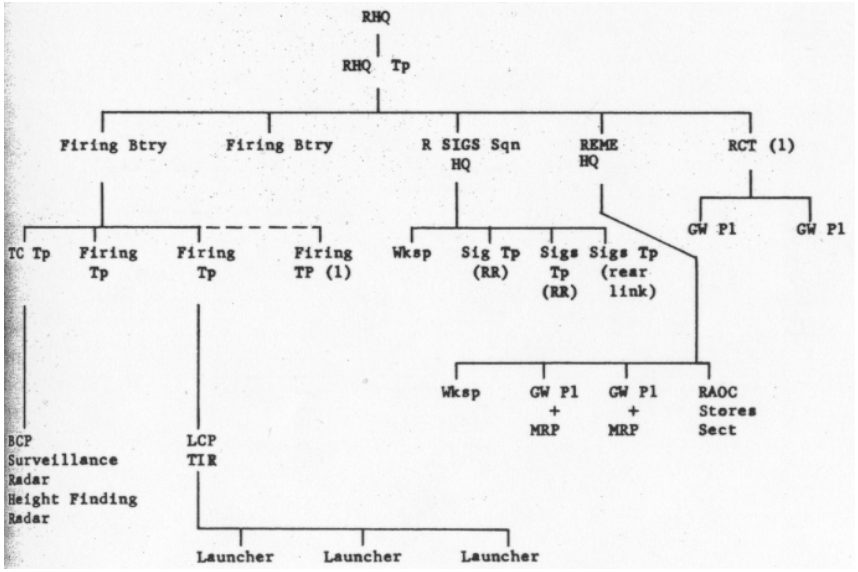


Figure 16. Heavy air defence regiment (Thunderbird MK 2).

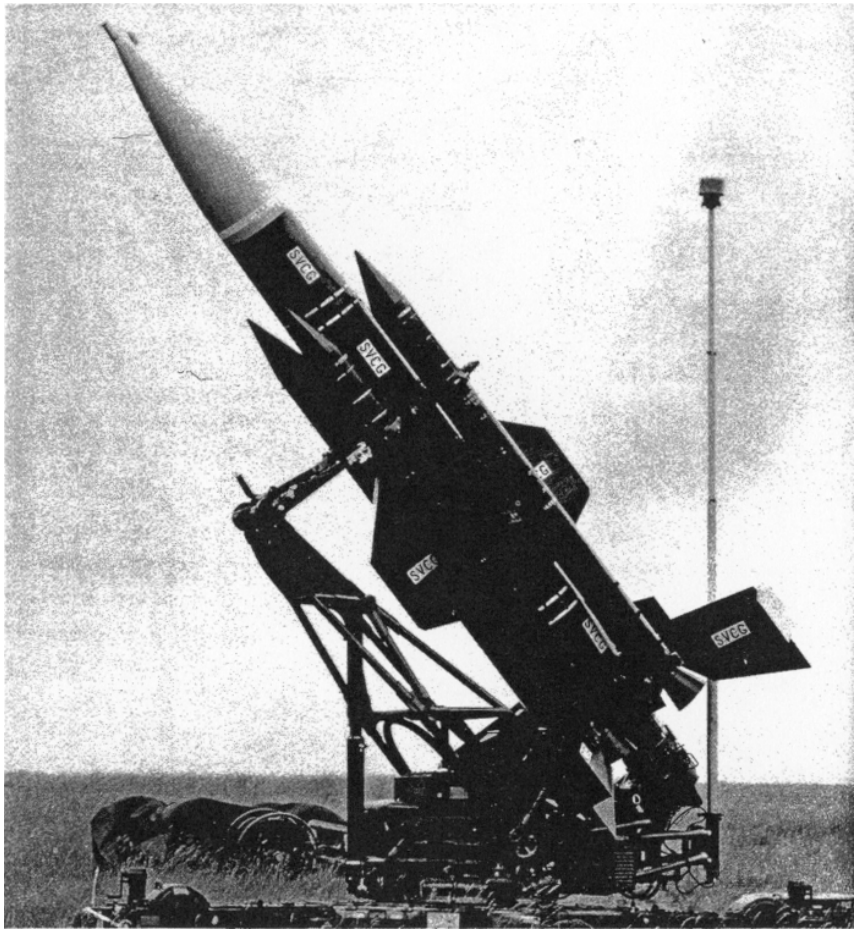


Figure 17. Thunderbird MK 2.

The Ministry of Defence planners believe that the self-supporting brigade concept is the answer to their commitments, which involves the dual capability of fighting either conventional or nuclear war.

HONEST JOHN INFORMATION LETTER

In February 1971 the US Army Field Artillery School published "Weapons Information Letter Number 9 (Honest John)". This letter contains information on current developments in equipment, procedures, and maintenance techniques for the Honest John system. It also provides advance notice of forthcoming changes to Honest John field manuals.

INSTRUCTIONAL DEPARTMENT NOTES

GUNNERY DEPARTMENT

ARTILLERY POSITION SELF-ILLUMINATION

Often, the tactical situation of artillery units has demanded that the units fire their own supporting illumination. Since earlier tabular and graphical firing tables did not provide for close-in self-illumination, units have had to devise expedient solutions for this problem. Although a selected charge, elevation, and fuze setting could produce the desired illumination, several uncertainties were involved. The height of burst (HOB), the range to the HOB, and the point of impact for a nonfunctioning projectile (dud) were not actually known. To correct these deficiencies, new GFT's have been made for the 155-mm illuminating projectile and new GFT's are to be made for the 105-mm illuminating projectile.

The significant physical differences between the older and the newer 155-mm illuminating projectiles made it necessary to give priority to the manufacture of GFT's for these projectiles. The designation of this series is Scale, Graphical, Firing 155AH2-ILLM485, FSN 1220-442-2444 for the M109 and 155Q4ILLM485, FSN 1220-133-6219 for the M114. These scales should be requisitioned if they have not yet been received. The range scale is constructed logarithmically rather than linearly. A GFT setting geometrically applies a constant range K instead of the variable range K possible with slant-scale GFT's, but the error is negligible, considering the radius of illumination. Charge 1 data starts at a range of 500 meters, making it possible to provide illumination of the firing position and the area immediately in front of it. Fuze activation and parachute deployment at the shorter ranges of charge 1 occur on the ascending leg of the trajectory.

Similar GFT's are to be manufactured for the newer 105-mm illuminating projectiles. The present GFT's will be satisfactory until the new ones are available for issue, although slight inaccuracies exist. To supplement the current TFT's and GFT's a table for charge 1 is provided below that will serve as a guide in firing close-in illumination. Although the maximum elevation for the M101A1 is 1,156 mils, higher elevations may be obtained by position modification.*

CHARGE 1 M101A1/M102/M108 — CARTRIDGE, ILLUMINATING, M314A2E1 FUZE MT M565

1	2	3	4	5	6	7
RANGE TO BURST	ELEV	FS FOR FUZE M565	CHANGE IN ELEV FOR 50-METER INCREASE HEIGHT OF BURST FOR FUZE M565	FS	RANGE TO IMPACT IN M101A1	M102/M108
METERS	MILS		MILS		METERS	METERS
300	1,263	5.0	24	0.3	1,833	1,862
400	1,170	5.3	28	0.3	2,224	2,260
500	1,087	5.7	33	0.3	2,513	2,554
600	1,016	6.0	35	0.3	2,711	2,754
700	957	6.5	35	0.3	2,845	2,883
800	907	7.0	36	0.3	2,918	2,964
900	867	7.5	36	0.3	2,964	3,011
1,000	834	8.1	36	0.3	2,989	3,035
1,100	809	8.7	35	0.3	3,000	3,047
1,200	789	9.4	34	0.3	3,004	3,050

FADAC TELETYPEWRITER

The fact that a teletypewriter is a legitimate, integral piece of associated equipment for the M18 gun direction computer (FADAC) apparently is not common knowledge.

Honest John, FATAB, and division artillery headquarters units are the only field artillery units authorized a teletypewriter, and the teletypewriter is essential for the resolution of their requirements.

For the survey information centers, there is absolutely no output possible from FADAC without a teletypewriter, making it as critical as the computer and the power source in the use of the survey programs.

In Honest John units, the speed and accuracy of the machine process would be negated by having to make a handwritten record of data and would greatly increase reaction time and the chance for error.

**A warning should be issued to personnel in and around the position area as to the possibility of debris from the illumination rounds falling in the immediate vicinity of the firing unit.*

The TT/537/G teletypewriter prints 72 characters to a line at a speed 60 or 100 words a minute (TM11-5815-206-120) and produces a permanent record of—

- Firing point lists.
- Target lists.
- Firing data.
- Survey control data
- Meteorological data reduction.

The TT-537/G, which has been type classified as standard A, is available for issue from depot stock under the authorizations listed below. The current experimental teletypewriter TT-412/TG/C, which is to replace the TT-537/G, is expected to be available in 1972 for issue as the forward area teletypewriter AN/UGC74. The new teletypewriter will print 150 words a minute and may be capable of greatly exceeding that speed.

Contrary to some publications, the AN/TGC-14, a US Marine Corps teletypewriter, is **not** authorized for issue to US Army units in lieu of the TT-537/G for use with FADAC, even though the AN/TGC-14 is compatible with FADAC.

Each field artillery unit organized under the following tables of organization and equipment (TOE) is authorized one teletypewriter TT-537/G, line item number V38758, Federal stock number (FSN) 5815-926-7378.

6-176—Headquarters and headquarters battery, field artillery battalion (Honest John), armored, infantry, or mechanized infantry division.

6-177—Field artillery battery, field artillery battalion (Honest John), armored, infantry, or mechanized infantry division.

6-201—Headquarters and headquarters battery, airborne division artillery.

6-302—Headquarters and headquarters battery, armored, infantry, or mechanized infantry division artillery.

6-526—Headquarters, headquarters and service battery, field artillery battalion (Honest John) (nondivisional).

6-527—Field artillery battery, field artillery battalion (Honest John) (nondivisional).

6-576—Headquarters and headquarters battery, field artillery target acquisition battalion.

6-701—Headquarters and headquarters battery, airmobile division artillery.

Each LANCE unit, when fielded, will also be authorized a teletypewriter to be used with the gun direction computer.

Maintenance and service of the TT-537/G is similar to that of the TT-335/G and the TT-4/G.

The important point is that each Honest John unit and each survey information center that is authorized an M18 gun direction computer is also authorized a teletypewriter as an output device. If a teletypewriter is authorized for your unit, be sure to obtain it and use it.

EFC VALUES CORRECTION

The statement appearing in the last paragraph on page 20 of the April 1970 issue of **The Field Artilleryman** concerning the assignment of an EFC value of 3.00 to each zone 3 round fired without the additive jacket M1 is in error. Although the average ratio of wear is 3:1 for nonuse versus use of the additive jacket, this varies with the age and wear of the tube. Tube life has been established as 1,200 EFC rounds or 0.200 inches of wear, whichever occurs first; therefore, firing without the additive jacket will cause the tube to become unserviceable from wear before the 1,200 EFC life is reached. An EFC value of 1.00 should be assigned to all zone 3 firings with the M113E1 tube with or without the additive jacket, and personnel should be aware of the fact that nonuse of the additive jacket will result in excessive tube wear and reduced tube life.

DIRECTOR OF INSTRUCTION

FOLLOWUP QUESTIONNAIRE PROGRAM

Commanders are reminded that the followup questionnaire is one of the principal means used by the U. S. Army Field Artillery School to insure that it is meeting the needs of units in the field. These questionnaires are inserted in the personnel records of School graduates with appropriate instructions to the personnel officer who removes and distributes them to the former student and his immediate supervisor 4 to 6 months after the graduate has been assigned to his new unit. The crucial role played by the personnel officer in this program cannot be overemphasized. Command emphasis to insure that the questionnaires are being distributed, completed, and returned to USAFAS is necessary to insure an adequate training evaluation program.

TARGET ACQUISITION DEPARTMENT

POSITION AND AZIMUTH DETERMINING SYSTEM (PADS)

The field artillery's requirement for accurate and timely survey control for weapons and target acquisition devices is the basis for the development of a mobile, self-contained, surveying system designated the position and azimuth determining system (PADS). The need for this system is documented in a Department of the Army approved qualitative materiel development objective. The two versions of the PADS are a ground version for use in a utility vehicle and an airborne version for use in a light observation helicopter.

As a result of studies performed by Litton Industries' Guidance and Control Systems Division under contract to the US Army Engineer Topographic Laboratories, a feasible technical approach has been formulated for meeting the requirements of the ground version. The approach exploits the advances in the field of inertial technology made during missile and space vehicle guidance programs. The main components of the ground version of the PADS are an inertial measuring unit, a laser velocimeter, and a computer and display unit. As the vehicle moves from a starting control point, the inertial measuring unit, aided by laser-determined velocity data, feeds signals to the computer. These signals permit a determination of changes in horizontal and vertical position with respect to the starting point. The easting, northing, and height coordinates can be displayed for any point over which the vehicle stops. Additionally, a theodolite fixed to the intertial measuring unit will permit a readout of azimuth.

A similar inertial system will constitute the main element of the airborne version. A satisfactory velocity aid for use in the airborne version has not been formulated.

The basic sensors of an inertial measuring unit are gyroscopes. Hence, the accuracy of the system decreases with time as a result of gyro drift. A goal in the PADS development program is to maintain the positional and directional accuracy required by weapon systems during a 6-hour survey mission.

Fabrication of an engineer design model to demonstrate feasibility of the ground version is expected to begin in FY 71.

COMMUNICATION/ELECTRONICS DEPARTMENT

CAUTION FOR OPERATORS OF AN/VRC-12 SERIES RADIO EQUIPMENT TO PREVENT OVERHEATING

The blower motor, part of the heat exchanger in the receiver-transmitter RT-246/VRC and receiver-transmitter RT-524/VRC, operates to protect vital internal components against damage resulting from overheating. The blower motor will be actuated under **two** conditions: When the set is keyed, when the internal temperature reaches 140° F.

The operation of the blower motor when the set is turned on and keyed is usually accepted as normal by an operator. However, when the blower motor suddenly begins to operate because of a dangerous temperature rise within the set, some operators think that this is an abnormal condition. As a result, an operator might attempt to correct the trouble and, while doing so, could cause damage to the equipment or disrupt communications.

All personnel operating receiver-transmitter RT-246/VRC or RT-524/VRC should be reminded that there are **two** conditions under which the blower motor will be activated. This is especially important in environments of high ambient temperatures, since the equipment will be damaged quickly if the blower motor is not operating.

GUARDIAN OF THE SOLDIER'S WARRANTY

NOTES FROM THE US ARMY FIELD ARTILLERY BOARD

Field artillerymen keeping track of the progress of the Army's tactical fire direction system AN-GSG/10 (TACFIRE) should note with interest that the first phase of the Manual/FADAC Comparison Test began at Fort Sill, Oklahoma, on 14 December 1970. This comparison test—which was initiated by the U.S. Army Field Artillery Board (USAFABD)—is designed to measure the performance of a field artillery organization using the manual/FADAC system to accomplish artillery fire direction and planning functions. Later, upon completion of the TACFIRE Engineering Test/Service Test, the performance of the unit which performed the manual/FADAC test will be compared with the performance of a unit employing the TACFIRE system. III Corps Artillery, Fort Sill, is providing the tactical units for the test; USAFABD, Fort Sill, is providing the test evaluators.

The performance test is being conducted in three phases. Phase I consists of three, 96-hour, battalion nonfiring field exercises. Phase II will be a 48-hour, battalion live firing exercise. Phase III will consist of two 96-hour, division artillery nonfiring field exercises. The composition of these field exercises is based on requirements for support of maneuver elements operating under varied tactical situations in different geographic locations. The field artillery organization for combat for the tests ranges from a single battalion in direct support of an infantry brigade in low-intensity warfare to a division artillery in an attached group supporting an armored division in high-intensity warfare. The TACFIRE manual/FADAC performance test will be completed by 26 March 1971.

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AH-56

Lockheed-California Co. says it has remedied virtually all problems of the AH-56A compound helicopter cited in a cure notice from the Army a year and a half ago. Lockheed test pilots are flying the AH-56A Cheyenne now in tests at the Yuma Proving Ground, where Army test pilots are undergoing familiarization for service flight tests slated to run from January through July, 1971.

TRAINING FILMS

The US Army Field Artillery School is soliciting assistance in reviewing the following list of film synopses. Comments should identify those productions which require revision or deletion as a result of changes in doctrine, tactics, or operational procedures. Particular attention should be given to identification of new requirements for training films to assist in the accomplishment of individual unit training missions. Replies should be addressed to: Commandant, US Army Field Artillery School, ATTN: ATSFA-DI-TV, Fort Sill, Oklahoma 73503.

FILM	SYNOPSIS
6-1533*	Countermortar (B&W-25 min-1949) Latest countermortar methods of locating enemy mortar-Forward observers, air observation and photographs, analysis of craters, radar, etc.
6-1686*	Crater Analysis (B&W-21 min-1952) Operation of crater analysis teams illustrating various techniques used-importance of information gleaned in neutralizing enemy positions.
6-1757*	Field Artillery Radar (B&W-22 min-1953) Illustrates the various missions which can be accomplished by radar units organic to field artillery.
6-1775	Field Artillery Sound Ranging (B&W-23 min-1953) Discusses the mission, capabilities, limitations, and operation of the sound ranging platoons of the field artillery observation battalion.
6-1991*	Service of the Piece-105MM Howitzer (B&W-34 min-1955) Weapon positioned, uncoupled and set for action-Fire commands and fuze settings-Care and cleaning-Coupling and locking for travel.

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* *An asterisk denotes those films which have already been identified as requiring revision.*

6-2258 Introduction to Flash Ranging
(B&W-18 min-1956)
How flash ranging platoon spots and reports targets and battle field information to artillery units-Capabilities and limitations of flash ranging.

6-2374 The 762-MM Rocket-Pt I-Introduction to the System (M38)
(B&W-16 min-1957)
Characteristics, assembly, and loading of rocket on launcher-leveling and laying of launcher-Final checks and adjustments, and firing of rocket.

6-2375 The 762MM Rocket-Part II-Mechanical Assembly (M38)
(B&W-14 min-1957)
Transfer of components from cargo truck to rocket trailer-Mechanical assembly of components on trailer-Safety precautions.

6-2376 The 762MM Rocket-Part III-Electrical Testing (M38)
(B&W-16 min-1957)
Checks on rocket motor, flight cap, motor igniter continuity and ground, spin-rocket continuity and ground-safety precautions.

6-2377 The 762MM Rocket-Part IV-Loading (M38)
(B&W-13-min-1957)
Removal of assembled rocket from trailer and loading on rocket launcher-use of wrecker boom and handling beam-duties of crewmen.

6-2378 The 762MM Rocket-Part V-Preparation for Action (M38)
(B&W-19 min-1957)
Laying and leveling launcher-Emplacing and leveling wind measuring set-Placing aiming posts-recording deflection.

6-2379 The 762MM Rocket-Part VI-Firing and March Order (M38)
(B&W-20 min-1957)
Electrical checkouts, application of firing data and wind corrections, firing of rocket, equipment set in traveling position, march order command.

6-2424* Artillery Orientation by Sun and Star-Part II-The Hour Angle Method
(B&W-12 min-1957)
Computing the true azimuth of Polaris, converting true azimuth to grid azimuth, use of corps grid coordinates for effective fire.

6-2800* Artillery Battalion Survey-Part I-Methods
(B&W-24 min-1959)
Purpose and methods of survey-Astronomic observation, traverse, triangulation, intersection, and 3-, 2-, and 1-point resection.

6-2850 Artillery Orientation by Sun and Star-Part I-The Altitude Method
(B&W-15 min-1960)
Principles applied in computing the true azimuth by means of the altitude method of solar observation to give accuracy to artillery fire.

6-2875* Artillery Battalion Survey-Part II-Planning and Execution
(B&W-21 min-1960)
Value of survey for artillery fire-Formulation of survey plan-Methods used to establish survey control and determine positions for various battalion elements.

6-3096* Countermortar Radar AN-MPQ-4A
(B&W-22 min-1961)
Capabilities, components, and operation of the Q-4 Performance of complete mission in field from initial intercept to transmission of map location of enemy position.

6-3122* Extension of Direction by Simultaneous Observation
(B&W-23 min-1961)
Principles, procedures, and advantages of simultaneous observation for rapid and accurate artillery survey-Application of techniques during day and night.

6-3184 The AN/TPS-25 Ground Surveillance Radar, Moving Target Detection
(B&W-21 min-1962)
Audio returns picked up by AN/TPS-25 from: Walking personnel, light and heavy wheeled vehicle, vehicle dispersion maneuver, tracked vehicle, and tanks.

6-3185* Countermortar Radar AN/MPQ-4A, Preparation and Performance Checks
(B&W-26 min-1962)
Preliminary adjustments, starting procedures, range calibration, ringtime checks, azimuth, and elevation orientation, computer checks, introduction of radar location data into computer.

6-3248* The 318MM Little John Rocket-Part I-Introduction to the System
(B&W-23 min-1963)
Organization and duties of Little John unit-Features and operation of Little John equipment-Handling and preparation for firing-Firing-Preparation for march order.

6-3249* The 318MM Little John Rocket-Part II-Description of Equipment
(B&W-28 min-1963)
Features of rocket components launcher trainer, mating device, handling equipment hoist assembly, equipment delivery basket, wind measuring and rocket conditioning sets.

6-3250* The 318MM Little John Rocket-Part III-Assembling. Transporting, and firing.
(B&W-31 min-1962)
Action of a 318MM Little John unit from time of receipt of weapon through execution of a fire mission; assembly of rocket, preparation for firing, and firing.

6-3251 The AN/TPS-25 Ground Surveillance Radar
(B&W-30 min-1963)
Features and surveillance capability-Modes of operation and application in target identification-Automatic search, automatic range, manual search, manual track audio, and manual track video.

6-3261 Laying the Field Artillery Battery
(B&W-15 min-1963)
Techniques and equipment used in basic methods of laying battery in direction of fire: (1) by azimuth, (2) by orienting angle, and (3) by aiming point and deflection.

6-3298 The 762MM Rocket XM50-Part I-Introduction to the System (Honest John)
(B&W-21 min-1963)
Features and capabilities-Measures employed by crew in preparing firing the weapon in a tactical mission-Preparing for march order.

6-3299 The 762MM Rocket XM50-Part II-Mechanical Assembly and Electrical Checkout (Honest John)
(B&W-30 min-1963)
Equipment and procedure employed during: Initial assembly and transfer to handling unit-Calibration and electrical checkout-Final assembly at firing position-Transfer to loading position.

6-3300 The 762MM Rocket XM50-Part III-Loading, Preparation for Action, Firing, and March Order (Honest John)
(B&W-37 min-1963)
Organization and action of firing section and equipment used to load rocket onto launcher, employment and laying launcher, preparation for firing, firing, and march order.

6-3306* RSOP, Reconnaissance, Selection and Occupation of Position-Part I
(B&W-22 min-1963)
Technique used by 105MM Howitzer Battery for day reconnaissance, and selection and night occupation of position-Team work at battery level and coordination with other units and higher command.

6-3307* RSOP, Reconnaissance, Selection and Occupation of Position-Part II-Ilimited Reconnaissance
(B&W-14 min-1963)
Principles and techniques employed by artillery battery in conducting an occupation of position from march column formation.

6-3385 Artillery Forward Observer-Part I-In the Defense
(B&W-18 min-1964)
Film covers assignment and actions of a forward observer supporting a rifle company under enemy attack.

6-3386 Artillery Forward Observer-Part II-In the Offense
(B&W-12 min-1964)
Preparation and action of forward observer to provide close firing support to mechanical rifle company in the offense-Focus on action before and during the attack.

6-3436 The Honest John Battalion-Part I-Organization and Operations (XM50)
(B&W-16 min-1964)
Organization, layout, tactical capabilities and deployment of Division Honest John Battalion, with focus on function of Headquarters and Headquarters Battery and Firing Battery, deployment of launchers, and role of Battalion fire direction center.

6-3448* Fire Direction Procedure-Part I-Precision Fire
(B&W-37 min-1964)
Methods and procedures used by fire direction center in precision registration of 105MM Howitzer Battalion-Action from initial fire request to subsequent fire commands.

6-3449 Fire Direction Procedure-Part II-Area Fire
(B&W-25 min-1964)
How fire direction center of 105MM Howitzer Battalion conducts area fire for an observed fire mission and a fuze variable time mission without observation.

6-3450 Fire Direction Procedure-Part III-The Observed Firing Chart
(B&W-29 min-1964)
How fire direction center of 105MM Howitzer Battalion constructs observed firing chart: (1) when time fuze is available and site unknown, and (2) based on register and position area survey.

6-3451 The Honest John Battalion-Part II-Reconnaissance, selection and occupation of firing position, firing, and displacement for movement to new position.

6-3456* Operation of the Surveying Instrument, Azimuth Gyro Artillery
(B&W-25 min-1964)
Procedures, visual indications, and computations required to operate the instrument for determination of true azimuth.

6-3499* Field Artillery Target Acquisition Battalion
(B&W-26 min-1964)
Tactical missions and organization of field artillery target acquisition battalion-How it is employed to support Corps and Division artillery-Target acquisition by means of flash, sound, and radar.

6-3515* Active and Passive Defense of the Field Artillery Battery
(B&W-29 min-1965)
Reconnaissance selection and occupation of position of a field artillery battery position for providing close fire support, with focus on the measures taken for active defense and passive defense of position.

6-3517* The Pershing Missile System-Track Mounted & Aircraft Operations
(B&W-33 min-1965)
How Pershing, transported in tracked carrier, performs fire mission-How Pershing, transported in fixed wing and helicopter aircraft, performs fire mission.

6-3558* The Sergeant Missile System
(B&W-22 min-1965)
Organization of Sergeant Battalion-Features and capabilities of Sergeant System-Displacement of firing position, emplacements of components, preparation for firing, and actual firing.

6-3609* Pershing Missile Azimuth Laying Procedures
(B&W-19 min-1966)
Emplacement of orienting station and horizontal laying and vertical laying theodolites-Reciprocal collimation and autocollimation-Monitoring phases.

6-3646 Weapons of the Field Artillery
(Color-39 min-1966)
Features, use and capabilities of field artillery weaponry in the cannon type artillery, category and rocket and missile category.

6-3666* Measuring Distance with DME, MC-8
(B&W-29 min-1966)
Design, capability and application of DME, the new measuring equipment for artillery surveys at Division Artillery level-DME operation is demonstrated in a field survey.

6-3725 The FA Digital Automatic Computer M18 (FADAC)-Introduction and General Characteristics
(B&W-18 min-1966)
Capability of FADAC-How it is set up and prepared for operation-how information is fed into it-mechanics of the FADAC computation process-FADAC checks and maintenance.

6-3726 Operation of the FA Digital Automatic Computer M18 (FADAC)-Cannon Application
(B&W-19 min-1966)
Applicability of FADAC: To solve fire problem for 105MM Howitzer Unit at new location; to correct fire solution during area mission to correct registration.

6-3727 Operation of the FA Digital Automatic Computer M18 (FADAC)-Rocket Application
(B&W-22 min-1699)
Capability of FADAC for Honest John and Little John programs; applicability of FADAC in an Honest John fire mission.

6-3897 On-Carriage Fire Control Equipment
(B&W-21 min-1969)
Application of the Testing Target and Distant Aiming Point methods of boresighting to achieve accurate artillery fire.

6-3984 Air Induction and Diesel Fuel System, 8V71T Engine (Full Tracked Vehicles)
(Color-28 min-1969)
Features, functioning, and maintenance of the air induction and diesel fuel systems of the 8V71T engine used in the M108, M109, M110, and M578 self-propelled, full-tracked vehicles.

6-4050 Artillery Ammunition and Fuzes (1969)

6-4021 Service of the Piece-105MM Howitzer (1969)

6-5246* Field Artillery Observation
(B&W-19 min-1967)
New terms, phrases and format effected by U. S. Army, 1 September 1966, in FO communications and procedures for improved direction of FA fire.

6-7900 Fire-Artillery Action in Korea
(B&W-14 min-1952)
Depicts the important role of artillery fire in modern warfare.

M109A1 HOWITZER

Final tests of an improved 155-mm self-propelled howitzer (the M109A1) have been completed, and the weapon will be in the hands of troops in the near future. The new tube, eight feet longer than that on the older M109, provides a significant increase in range. It also incorporates an improved bore evacuator.

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